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Improvements in Electric Light Fixtures.

That improvement is the order of the day in those circles furnishing apparatus to deal with the electric current is better shown in no one branch of the industry than in the manufacture of electroliers and electric light fixtures in general.

A recent catalogue sent out by the well-known gas fixture house of Messrs. Oxley, Giddings & Enos, of this city, is strong proof in support of the above statement. The catalogue presented a number of very attractive, new and graceful designs in electroliers, combination fixtures, pendants, brackets, etc. We illustrate two standards manufactured by this company. The larger one (Fig. 1), originally manufactured expressly for the Carrollton House, Baltimore, has become deservedly popular in electrical circles, and although from its fine workmanship is necessarily somewhat expensive, it is meeting with much demand.

In all the designs presented by this company there is exhibited a grace and finish that is highly complimentary to the artistic ability of the company.

An Italian Commission on Electric Traction.

The Società Anonima degli Omnibus of Milan some time ago selected three engineers to travel through Europe, inspect the various electric traction roads in operation, and report on the adaptability to their tramways in Milan. The main part of the report of the experts is taken up with the description and discussion of storage battery systems; overhead, underground, and rail conductor systems being only incidentally mentioned. The commission was unable to make a report on any line that was a complete financial success. The system in Brussels has not given perfect satisfaction, although improvements have been made that will reduce the cost. The road is on a small scale, however, and it does not necessarily follow that it would not pay even now if it was on a larger scale. The road, too, is a difficult one, with long grades of over three per cent A careful study was made of the different types of accumulators in use at present, and an estimate is made of the comparative cost of storage battery traction, as compared with that of horses. As a result, the commission advised that electric cars be tried, and states that it would be an honor to Milan, which was one of the first cities in the world to adopt electric lighting on a large scale, to be also one of the first to utilize electricity for the propulsion of its tramcars.

Electricity in Iron Mining.

An application of electricity to iron mining is now proposed. It consists in the crushing of magnetic iron by crusher and rolls, and effecting a separation of the ore from the gangue by means of dynamos. An experimental plant is to be erected at one of the Marquette mines, and the machinery best adapted for work on a large scale tested. With the large waste-rock piles of magnetite on that range, and a due regard to economies and fair prices for ore, it is thought that there should be developed a paying business of handsome proportions.

Storage Battery Patents.

We are in receipt of the following statement from the Electrical Accumulator Company:

The *Electrical World* of December 22d, 1888, contains a statement from the Julien Company by which it is made to appear that the application of the Electrical Accumulator Company for a certain patent has been refused by the United States Patent Office.

Such a statement is not true; on the contrary, the Commissioner of Patents, Washington, has just rendered a decision sustaining the claims of John S. Sellon as the inventor of an inoxidizable alloy support plate, and Mr. Sellon's patent has been passed to issue, and will shortly appear on the patent records duly assigned to the Electrical Accumulator Company. The application of Sellon was founded upon the specification of his English patent, No. 3,987, dated September 15, 1881. This British patent of Sellon's is the first publication to describe the use of a plate of lead and antimony, or an alloy of two metals, either with or without the use and application of an amalgam as a support for the active material in a battery of the Faure type. The issue of this patent in the United States will enable the assignee of Sellon, the Electrical Accumulator Company, to control the manufacture, use and sale, of secondary batteries employing lead and antimony in the composition of support plates, whether mercury to form an amalgam be present or not, and suits will be instituted in the courts for the recovery of damages at once.

FIG. 1.—COMBINATION STANDARD.—OXLEY, GIDDINGS & ENOS.

—— The Electro-Dynamic Company, of Philadelphia, has obtained the contract for lighting the Brooklyn Navy Yard, their bid being $3,100.

Artesian Wells and Electric Lights.

The new artesian well (*de la Chapelle*) is to be used in Paris for purposes of electric lighting. It is one of the deepest in the world, the water rising from it with considerable force. The force is reckoned sufficient to work machinery for the lighting of the surrounding part of the capital. This departure combines something new alike in artesian wells and in electric lighting.

FIG. 2.—ONE-LIGHT ELECTRIC STANDARD —OXLEY, GIDDINGS & ENOS.

—— The owners of the Swarts building, in this city, have contracted for a 600-light Edison plant with 200 storage cells from the Electrical Accumulator Company, for the purpose of lighting the building.

Electricity in Boiler Explosions

Concerning the early theory that all boilers were exploded by electricity, Mr. J. M. Allen, president of the Hartford Steam Boiler Inspection and Insurance Company, in a lecture on "Steam Boiler Explosions" delivered recently before the students at Cornell University, gave the following interesting facts:

"This theory is said to have become popular in this country more than 50 years ago, from the explosion of a locomotive on the Baltimore and Ohio Railroad during a thunder storm. It was asserted that it was struck by lightning. Subsequently, another exploded on a clear day, but as the subject of boiler explosions had at that time been little studied, and as there seemed to be no ready explanation, it was assigned to the same cause. About this time, at the request of the Treasury Department of the United States, the Franklin Institute of Philadelphia instituted a series of experiments to test the truth or falsity of the various causes assigned for the explosion of steam boilers.

"Before speaking of the experiments of the Franklin Institute, I will say a word about the theory of explosions from electricity. Some 40 years ago, in England, a locomotive at rest was found to emit brilliant sparks while the safety valve was blowing. This was thought by some to be conclusive evidence that electricity was stored up in a boiler under pressure, and that, under certain conditions, it might act with explosive results. This led to a careful investigation of the subject by men of high scientific attainments. The result was that the presence of electricity in a jet of steam issuing from an orifice was not due to free electricity within the boiler, but to the friction of the escaping steam upon the inner surfaces of the discharging channel.

"If electricity should be developed in a steam boiler by ebullition, or in steam when confined under pressure in an iron boiler in perfect electric communication with the earth, it could not be collected, but would be immediately conveyed away. Prof. Faraday investigated this matter, and his conclusions were:

1. 'The production of electricity is not due to any change in the state of the liquid contained in the boiler.

2. 'A current of dry steam produces no development of electricity. The production of electricity is due to the friction in the nozzle of the drops of water formed by the partial condensation of the steam.

3. 'Increasing the pressure of the steam increased the development of electricity by increasing the friction of the issuing jets of steam and water.

4. 'The same results were obtained from compressed air, discharged through the box-wood nozzles, as from steam discharged under the same circumstances. When the air was perfectly dry, there was no development of electricity; when the air was humid and contained, besides, a very little pulverulent matter, the friction of discharge produced electricity in the same manner as when steam was employed in the experiments.'

"The boiler which was used in these experiments was insulated on glass supports or legs, and yet the experiments under these most favorable conditions conclusively showed that electricity could not be counted among the causes of boiler explosions."

Extension of the San Jose Electric Railway.

An additional dynamo and four additional dummies have been ordered for the San Jose, Cal., electric road. It is also stated that an order has been placed with the Detroit Electrical Works, for the completion of the extension to Santa Clara.

The Sprague Electric Road at Boston.

We take pleasure in presenting our readers in this issue of our paper, with several views of the new electric street railway between Boston and Brookline, installed by the Sprague Electric Railway and Motor Company, of New York. There have been several trial trips made over this railway already, to test the apparatus, which has been found to be complete, and the road will be put into commercial operation in a few days.

The West End Street Railway, of Boston, of which this road is a part, is one of the largest street railways in the world; it extends over 12 miles of track, using 1,700 cars and more than 9,000 horses. The president of the West End Street Railway Company, Mr. Henry M. Whitney, of Boston, is universally recognized as being one of the most enterprising and successful street railway men in the country, and aided by an efficient corps of assistants, has succeeded in giving Boston, since his administration, the most efficient street railway service which ever existed in that city.

This system of electric railway called for in this contract is wide and comprehensive. The main line from Boston, westward, beginning at Park square, will run down Boylston street bridge, and then down Chester Park to Beacon street. It will then proceed over the Beacon street extension to the Chestnut Hill reservoir, and to Allston and Oak square, Brighton. From the East Park Gate over the new boulevard to the Chestnut Hill reservoir and Brighton, the Sprague overhead system will be adopted. In the more crowded streets of the city the Bentley Knight conduit will be used.

The power station from which the electric current is distributed to the line, is situated on Braintree street, Allston, near the Boston & Albany Railroad, and also at the edge of the water, thus giving both water and rail facilities for fuel. This building, which is the most perfect electric plant of its kind in the country, is situated very nearly equi-distant from the extremities, and is, therefore, literally, a central station. The station, with the adjoining car-house, is of brick and completely fire-proof. In its construction it was the aim of the West End Company to get the best in every detail. The chimney-stack is 100 feet high. The boiler house, which is both convenient and commodious, is at present equipped with three horizontal tubular boilers, furnished by the Jarvis Engineering Company. The engine room contains two high-speed automatic cut-off engines of the Armington & Sims pattern, of 200 horse-power each. Each drives two powerful dynamos of 80,000 watts each, and wound for a maximum pressure of 500 volts. These dynamos are of the highest efficiency and simplest construction, and if need be can be placed under the charge of the steam engineer. The dynamos feed into copper bus wires, supported on the walls by porcelain insulators.

Each machine has its independent ampere meter, and, in addition, there is a general ampere meter at the end of the positive bus bar. From this bar the current passes to special snap switches, each switch being connected through a three plug safety switch back to one of the feeders supplying current to the main line wire. These feeder wires tap into the line wire at different points on the line of road, thus maintaining the pressure approximately equal all along the line. At the ends of the feeders in the central station, pressure indicators are attached, which indicate the voltage at the junctions of the feeders with the main current wire.

The engine room is brilliantly lighted by handsome hanging electroliers, each of which has five incandescent lamps. A switchboard at one end of the room furnishes an independent control for each group of lamps. All the surroundings of the machines are kept in the neatest condition.

Adjoining the power house, but separated by thick brick walls, is a commodius house for accomodation of cars, 107 feet long by 80 feet deep, designed to hold 24 cars.

The overhead system, which is built under the Sprague patents, is of the finest description and includes iron poles set in concrete throughout the entire length of the road. These poles are of a very neat and tasteful pattern, and support the span wires which carry the trolley wire at a height of 18 feet over the center of the track. This overhead wire which is used for a working conductor, is made of silicon bronze, of the small Sprague type, only $\frac{3}{16}$ of an inch in diameter. This is the only wire suspended over the middle of the track, and its lightness and high tensile strength allows the overhead supporting structure to be of the lightest description possible. The poles are 125 feet apart.

FIG. 1.—POWER HOUSE OF SPRAGUE ELECTRIC ROAD AT BOSTON.

The return circuit is through the rail, and thence by both metallic and ground circuits to the station. Each section of rail is joined to copper ground wires, throughout the length of the road underneath the stringpieces. At intervals of 500 feet, this ground wire is connected to an earth plate, and at seven points widely distributed. The ground wire is connected to the station, and there is also a main ground connection made there through a large sink plate.

In the overhead system a new method of switching has been adopted, which is at once ingenious and simple. Five or six feet inside the turnouts a small switch with flaring rider is interpolated into the main and branch wires, and a spring tongue upon this directs the path of the "trolley" with absolute certainty and ease. By this means switching is made very easy, and all danger of the trolley leaving the wire is obviated.

The cars can be run at widely different speeds, varying from the slowest crawl to 12 or more miles per hour. They can be started and stopped without the use of brakes in the space of three or four inches, and when making the normal running speed can, in an emergency, be stopped and reversed without brakes within less than one-quarter of a car length. This is especially advantageous in crowded thoroughfares, and shows the superiority of the electrical car over the horse or cable cars. The control over the car seems marvelous, for one sees little or nothing save an almost imperceptible movement of the hand of the motorman; and the starting, although prompt, is very gradual and without shock or jar. The ordinary driver can operate one of these cars without the slightest trouble after a very brief instruction. The saving on the operating cost of the Sprague system, owing to the superior quality of the apparatus over an ordinary horse car line, constitutes no inconsiderable item. It has been found that the average cost of motive power per car a day throughout the United States, that is, from 10 to 11 hours, and trips aggregating from 45 to 50 miles, is about four dollars, and this counts only those horses on actual duty on the road. The cost of motive power per day per car for equal mileage in Richmond is less than two dollars on the heaviest sort of grade work, and at Boston it is estimated that even this low cost of operation will be reduced. For winter use upon this road the Sprague Company is equipping three electric "working cars," furnished with snow-plows, brushes, ice-cutter, and salt distributor, and each propelled by two powerful 30 horse-power motors. In front of the car is a revolving wheel which breaks up the snow crust completely, and behind are revolving brushes which sweep the tracks clean. It is estimated that this "working car" will clear a street railway track after a heavy storm more quickly than the ordinary snow-plow, drawn by 12 horses.

The system of wiring which the West End management has adopted for the crowded city streets is the Bentley-Knight conduit, now in use in Allegheny City, Pa. Here the conduit is laid midway between the tracks, and is strongly bolted to the stringers and sleepers. Its cross-section is about a foot square, and its upper part has a slot similar to that used in cable railways, its width, however, being only $\frac{5}{8}$ of an inch, giving an opening so small that carriage wheels will not catch in it. Besides this, it is so bevelled that horseshoe calks will not be held in it. Copper bars $1\frac{1}{4}$ inches thick, one on each side of the slot, firmly insulated beneath it, carry the current, one from the dynamo, and the other returning from the motors. The current is taken from the conductors to the motors by "ploughs," as they are called, two to each car. These ploughs are thin iron plates about 10 inches square, hung from a framework over the middle of the track, and projecting into the slot. The motors are connected by controlling switches, and the car is operated substantially as is the overhead system. The ploughs are so arranged that they can be lifted out of the slot when any obstruction is reached. The current is taken up and returned by spring plates, which slide along the copper conductors at the bottom of the plough.

In switching, two ordinary tongue switches are used, one in the conduit and one on the rail. Brushes attached to the snow-ploughs and cars easily keep the conduit and tracks clear, even in the severest snow storm, or in case of slushy and muddy weather.

The change from the overhead system to the conduit is made while the car is in motion, and without the slightest delay in travel or inconvenience to passengers, so that the Sprague cars run over the entire distance.

The kind of truck used upon this road is the latest Sprague improved truck, which has been fully described in these columns. The equipment of this truck includes the new "Boston" motor, which will be used, for the first time in commercial work, upon this road.

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PARK SQ & PROVIDENCE DEPOT
BRIGHTON & BOYLSTON ST. & W. CHESTER PARK
COOLIDGE CORNER AND CHESTNUT HILL
COOLIDGE CORNER, ALLSTON & OAK SQUARE
BEACON ST. BROOKLINE
BROOKLINE & BRIGHTON.
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FIG. 2.—SIDE VIEW OF THE CARS OF THE BOSTON ROAD.

Telegraph Alarm System.

When the Richmond telegraph alarm system was adopted by the police patrol service of Cleveland, O., the Fidelity and Casualty Company, of New York, went upon the Richmond Company's bond for two years, that the terms of contract should be faithfully carried out. The two years are up, and the Fidelity Company wrote to Secretary Vanek, asking him to formally release the company. Mr. Vanek went to City Solicitor Brinsmade about it Thursday morning, and the solicitor said it was unnecessary to take such a step, as the term of the bond had expired.

Some of the Contrivances to be Seen at the Patent Office.

The electrical inventions of the patent office have, within the last 10 years, grown into mammoth proportions. The great American brain seems to be devoting itself to electricity just now, and there is a class here devoted to this subject. In it are the divisions of electric signaling, telegraphy, telephony, electric lighting, medical electricity, electric motive power, electricity generation, electricity conductors and others. Each of these classes have sub classes, and new classifications have to be made every year or two. Before 1876 there were less than 2,000 patents granted for electricity. Since that time over 8,000 have been granted, and we now give out over 1,000 patents or electrical inventions every year.

And still electricity is in its infancy. It has made many of the big fortunes of to-day, and the Bell telephone and the Western Union telegraph are founded upon it. There are now electric street cars in many of the cities of the country, and a company has been formed in Baltimore to run a lightning express over an elevated railroad across the country for the carrying of mail and important express matter. The car used will be we understand, about the size of the average dry goods box, and the speed will be 600 miles an hour. This will beat the telegraph and pnuematic tube, and it will revolutionize much of the business of the country. By it a letter in your own handwriting can go from New York to Washington in 20 minutes, and Chicago will get the New York papers for breakfast. We will be able to send a package from New York to San Francisco in five hours, and the outcome of the whole will be that passenger travel will be carried on in the same way.

Annapolis Electric Light Company.

A meeting of the board of directors of the Annapolis Electric Light Company was held Friday last at the office of Mr. J. Frank Morrison, Baltimore, Md. General Joseph B. Seth, president of the company, occupied the chair. Mr. E. S. Riley, of Annapolis, acted as secretary *pro tem.* The resignation of Mr. Theophilus Tunis as treasurer was accepted, and he was succeeded in office by Mr. John Hubner, of Baltimore county. Mr. E. Alex. Seth resigned the secretaryship and Mr. E. S. Riley was elected his successor. Dr. George Wells was elected general manager, with supervisory powers over the construction of plants and buildings at Annapolis. Plans and specifications for the construction of the new station, machinery and apparatus, made by D. E. Evans, were approved. President Seth was authorized to ask for bids for the work. The company has on hand a contract to light the city of Annapolis with incandescent lights. One of the conditions of this contract was that the company should be ready to begin work on the 15th of the present month. The company was unable to fulfill this part of the contract, and the time was extended by the city council three months. The company at that time will have everything in readiness. The initial plant will furnish 3,000 incandescent lights and 200 arc lights. The directors of the Annapolis Company are Gen. Joseph B. Seth and Theophilus Tunis, of Talbot county; Dr. George Wells, Major Sprigg Harwood and E. S. Riley, of Anne Aruncel county; E. A. Seth and John Hubner, of Baltimore county; J. Frank Morrison and E. L. Tunis, of Baltimore city.

A New Electrical Submarine Boat.

The *Bulletin International de l' Electricité* states that the French Government has contracted for the building of a submarine boat, which, unlike the "Gymnote," recently tested at Havre, is to be used for defensive rather than an offensive purpose, its object being the destruction of submarine mines, and thus preparing the way for the main vessels of a fleet. It is to be cigar shaped, and is to be made of steel plates 0.16 inch thick. Its total length will be 14.95 feet, and its diameter five feet four inches. Its crew will consist of two men, who will be provided with air by stores of compressed oxygen, permitting a stay of several hours beneath the surface. The boat will be propelled by a screw driven by an Edison motor, the current to which is supplied by a Schanschieff primary battery.

An Electric Omnibus.

The electric omnibus left its stables in James street, Haymarket, on Monday morning, passing through Oxendon street, down through Coventry street, through Regent street and Conduit street to Bruton street, then by the south side of Berkeley square, through Charles street into Green street, South street, to Park lane, through Park lane to Upper Brook street, thence to Grosvenor street, and *via* Regent street, back to the stables at James street, Haymarket.

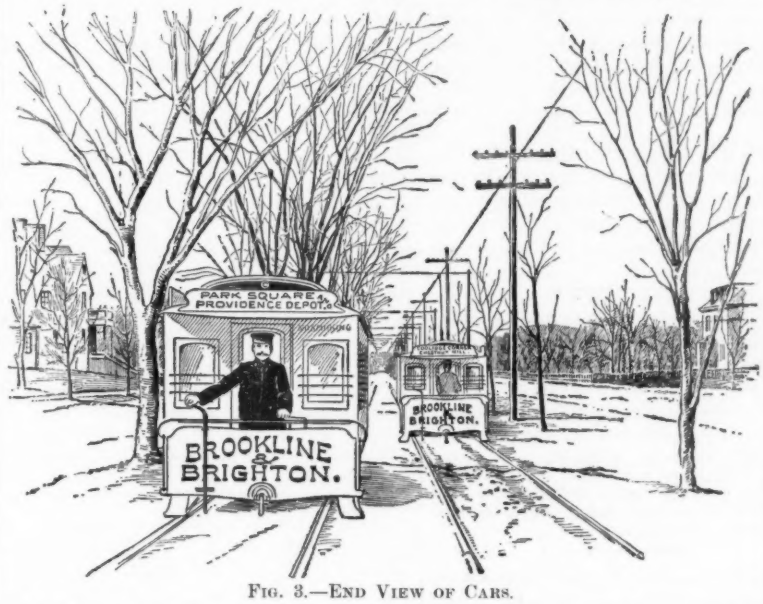

FIG. 3.—END VIEW OF CARS.

This is said to be the only electric omnibus in the world capable of steering to right and left, and of running on a common road without rails at a speed greater than that of horses.—*London Mining Journal.*

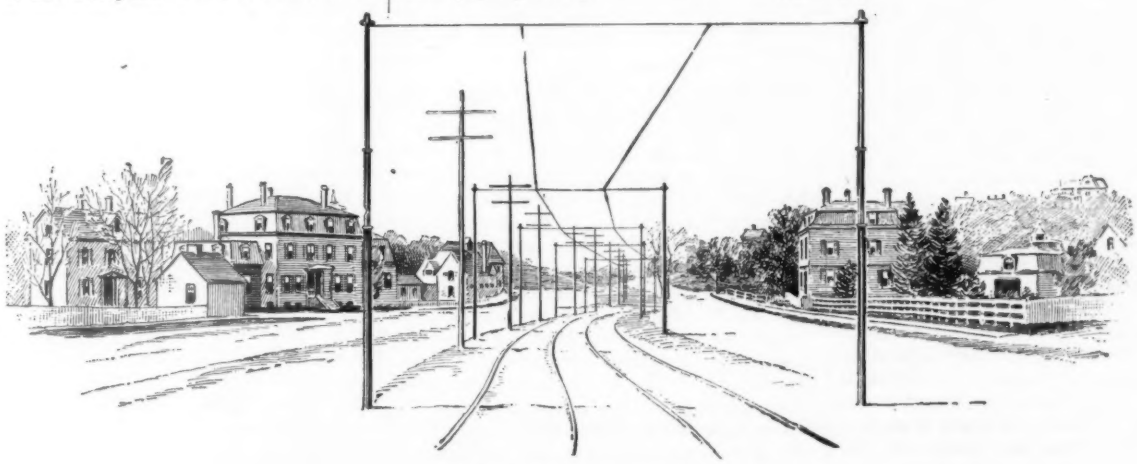

FIG. 4.—VIEW OF THE LINE.

A Narrow Escape for Mr. C. O. Baker, Jr.

Cyrus O. Baker, Jr., son of ex-Comptroller Baker, while passing along Broad street near Chestnut about 7 o'clock yesterday morning, was attacked by a vicious dog, which tore his coat, snapped madly at him and covered half his clothing with foam from its mouth. The dog was frightened away and the police tried to effect its capture.—*Newark Press Register.*

The many friends of Mr. Baker in electrical circles will all congratulate him in his escape from that most terrible danger, the bite of a mad dog. It was very fortunate, indeed, that the bite of the ferocious and maddened brute did not penetrate to the flesh, and this alone is probably what saved his life.

—— The Oakland, Cal., Electric Light and Motor Company has elected the following officers for the coming year: W. E. Dargie, president; T. W. Cordes, vice-president; H. Lund, secretary. Directors, D. E. Hayes, W. E. Dargie, C. R. Lloyd, T. W. Cordes and H. Lund.

—— The Fergus Falls Gas Company and the Fergus Falls Electric Light Company, of Fergus Falls, Minn., have been consolidated and are controlled by C. D. Wright, James Compton and others, who have formed a company.

—— The electric lights at Norwich, N.Y., were started up last week for the first time, and have been giving great satisfaction to the citizens of Norwich.

—— The Julien Electric Traction Co.'s cars are running on Fourth avenue, this city, from 86th street to the Post Office, daily, a distance, it is claimed, of 12 miles for the round trip, instead of from 36th street, as first stated.

——Gen. Jas. Jourdan has been making an examination of the various electrical motors in use, with a view to adopting some system for operation from Prospect Park to Coney Island, in place of the horse cars now in use. He will go to Richmond, Baltimore and Philadelphia to look at systems now in practical use in these cities. The Bentley-Knight inventions please him wonderfully well, but he wants to see them all before making a choice. The electrical road that is being built across New York City from Fulton Ferry attracts his attention.

Mount Vernon, N. Y.—The People's Electric Company, of Mount Vernon. Capital stock, $100,000.

Oconto, Wis.—The Oconto Electric Light Company. Capital stock, $20,000. G. Beyer and others, incorporators.

Mount Holly, N. Y.—The Riverton and Palmyra Electric Light, Power and Heating Company. Capital stock, $50,000.

Tiffin, O.—The Tiffin Electric Light Company, of Tiffin. Capital stock, $40,000. J. W. Shamplerger and others, incorporators.

Webster, Mass.—The Citizens' Electric Light Company, of Webster. Capital stock, $10,000. John W. Dobble and others, incorporators.

St. Joseph, Mo.—The Grove Electric Light and Power Company. Capital stock, $50,000. James Craig, Jr., and others, incorporators.

New Haven, Conn.—The Brewer and Visual Signal Company, of New Haven. Capital, $25,000. Julius C. Cable and others, incorporators.

Detroit, Mich.—The Archer Gas and Fuel Company, of Detroit. Capital stock, $1,000,000. Alexander DeLanos and others, incorporators.

Washington, D. C.—The Equitable Gas Light and Fuel Company, of Washington. Capital, $200,000. Charles Mitchell and others, incorporators.

Washington, O.—The Washington Electric Light, Heat and Power Company, Washington. Capital, $10,000. Daniel McLean and others, incorporators.

Chicago, Ill.—Bessemer Spike, Nail and Staple Company, Chicago. Capital, $500,000. Incorporators, Eldridge, William T. Eagan and A. Mitchell.

Chicago, Ill.—The Western Light and Fuel Company. Capital stock, $250,000. Edwin E. Getchell, Hamilton Browne and William Barry, incorporators.

Chicago, Ill.—The American Electric Railroad Company, of Chicago. Capital stock, $1,000,000. H. Henry, H. Edgell and Stephen H. Emmens, incorporators.

Portland, Me.—Electric Auxiliary Fire Alarm Company, of Portland. Capital, $250,000. Joseph H. O'Neil and Patrick F. Murphy, incorporators, Boston, Mass.

San Francisco, Cal.—The Irving Patent Fuel Company. Capital stock of $500,000, divided into 50,000 shares. The directors are A. J. Mayer, Joseph Pracy, Jason I. Irving, James Hamilton and A. T. Nation, of San Francisco.

Pittsburgh, Pa.—The Fuel Furnace Company, Limited. The capital stock is $500,000, of which William Smith contributes $420,000, and John Nalor Smith and Edgar E. Smith, $40,000 each. The company is organized for the manufacture of gas fuel, vapor fuel furnaces, engines, etc.

Boston, Mass.—The Norfolk Street Railway Company has organized with the following-named officers: President, W. E. L. Dillaway; treasurer, H. M. Burton; clerk, T. E. Faunce. These gentlemen and M. M. Cunniff, George Miles, G. H. Miller and H. C. Stark, constitute the board of directors. The company has voted to accept the charter recently granted by the railroad commissioners. The company is awaiting an answer from the Hyde Park selectmen to its request for permission to use electricity as the motive power.

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EDITORIAL ANNOUNCEMENT

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☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegragh and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

NEW YORK, DEC. 29, 1888.

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A Merry Christmas and Happy New Year for you, one and all, brave men of the electrical confraternity!

Come to think of it, this is not such a bad world after all. Electrical stockings are of almost the average length and well filled.

It was this Paris-Bruxelles telephone line that has paid for itself in a single year, that the government was so slow in granting a concession for.

At a recent society dinner in Britain the name of each guest was marked on the petals of a fresh rose lying beside his plate, the writing in delicate lines traced by the aid of electricity.

Prof. Brackett, of Princeton, predicts that not a single criminal will ever be executed by electricity. We think he is right. Already there is a revulsion of feeling over this uncertain, sensational and unnecessary method of ending life.

While the electric light is gradually taking the place of illuminating gas in Germany, the latter article is evidently going to meet with an extensive sale in another direction, on account of its considerable evolution of heat. In comparison with the electric light, it is this property which is, apart from minor brightness, considered as its principal deficiency. It is stated that the heat from equal amounts of gas and coal is in the proportions of 26 to 15.

A recent paper by Mr. Leigh S. Powell on "Electrical Lighting of Domestic Fires," while only a re-development of an old idea, is well worth the reading. Such an apparatus as he speaks of was used at least six years ago by a viticulturalist, whose name we have forgotten, to light brushwood fires in vineyards during sudden and early frosts. He arranged hundreds of brush-heaps over the field, connecting them up in much the same way as described by Mr. Powell, and lighted them simultaneously to drive the chill from the ground.

The statue of the great Ampere has been inaugurated. This savan, the Newton of electrics, went from mathematics to physics, being born at Lyons January 22d, 1775. Speaking of the event, *La Lumiere Electrique* says that no sooner did the Academy of Science hear of the discovery of Oersted that the wire connecting the poles of a galvanic battery acts upon the magnetic needle than Ampere completed the discovery by giving precision to all the conditions of the experiment. He was the first to define the electrical current, recording the celebrated rule that the south pole is deflected to the left hand of the current.

The gramophone is said to bear no resemblance to the phonograph nor graphophone, but the further we read in its description the more we are assured that it does and a close resemblance at that. Of course it was conceived long before the phonograph. We could have guessed that without reading the statement. If a means of bringing green cheese from the moon and putting it in competition with our own pure milch-cow-cotton-seed-oil-dairy made article were discovered to-day, we do not doubt a Mr. Biffkins would rise up to-morrow and prove that, as long ago as 1840, the very same idea occurred to his grandfather one evening while gazing at the heavens through a toby of beer.

In another column we present a short account of the remarkable address of Professor Bracket, of Princeton, before the Electric Club, on Thursday evening. On account of its nearness to our day of publication, we are unable to present this week a stenograpic report of the address, which, though off-hand and entirely extemporaneous, was finished enough to have been a formal paper. Professor Bracket is a man who looks a long way into the future, and he presented in a thoroughly understandable way, the most advanced ideas on the all-absorbing question of the day—the relation of light and electricity. Those who had the good fortune to be present will not soon forget the intellectual treat.

ELECTRICAL SANGUINITY.

"There is our friend, the enemy and the enemy who calls himself our friend," says a writer in *La Lumiere Electrique*, "these two; one an open enemy to electrical progress because of contrary interests, and the other doing great harm by promising too much for electricity." Curiously enough it is the same in America as in France in this respect and, indeed, of the two, there is reason to believe the electrical fraternity will agree that the avowed enemy has not by any means been so baneful as the too enthusiastic and illy-informed friend.

From that time, now a decade ago, when the now robust child, electricity, was but a feeble infant, the science here has been pestered with a class that always promise too much. If apparatus for transmitting electrical energy showed itself capable of recovering at the end of the second machine 60 per cent. of the power applied to the first, then straightway went our enthusiast to promise it would receive 70 or 80 per cent. If a certain class of incandescent lamps showed a maximum life of 900 hours and a minimum life of 200 hours, he promised further an average life of 700 or 800 hours. Of course the interesting public unfamiliar with electric science, once they discovered that the thing was greatly exaggerated, would have nothing more to do with it until, after a long period of explanation and elucidation, the true facts were made apparent.

Apropos, listen to the people now prophesying 200 miles an hour for the electric motor of the future. Do they realize how fast that is? Have they any idea of the amount of friction which heavy machinery under such conditions would generate? Of the terrible wear and tear to roadbed as well as to train? Such persons will find instruction, and others entertainment as well, in a recent article on "Train Resistance," published in the *Engineer* (London). We know that electricity is peculiarly adapted to motors and high speed. But there is a limit beyond which it is not likely to be urged for economic as well as scientific reasons, and above all let us remember that progress is not the possibilities which we may see or think we see ahead, but in reality only that amount of advancement which can be proved by statistics.

PROF. BRACKETT OPPOSED TO EXECUTIONS BY ELECTRICITY.

The remarks published below were received with unanimous approval at the meeting of the Electric Club Thursday evening, December 20th, Prof. C. F. Brackett, of Princeton College being the lecturer of the evening:

The Chairman (Captain Candee): It has been happily suggested that possibly the Professor can give us some information regarding the execution of criminals by electricity, which will be of considerable interest this evening. It has taken up a good deal of time and discussion lately on the part of the newspapers and some of the electricians.

Prof. Brackett: The only experience I have had with the use of electricity in executing criminals has been in the class-room. I have about 150 papers that were written yesterday by the students at Princeton, and I have not the slightest doubt that some of them will die in consequence (laughter)—in consequence of what is written against it. My only experience in that line, I say, extends to them. I have some very simple notions, though, about the subject, and I want to say at the outset that notwithstanding the fact that in New York it is the law that all persons convicted of offenses that are punishable by death are hereafter to be executed in that way, my belief is that never a single man will die, except accidentally, by that method. I do not believe that New York even has the nerve to undertake to do so outrageous a thing as it seems to me that would be. The sensational character of the performance and the degrading of an agent which has done so much and is accomplishing more for the advancement of civilization than almost any other discovery in the history of the world, by applying it to such an ignoble use, and the uncertainty which there is in the application of it, it seems to me are three very strong items against the attempt to use it, and with all due deference to the law makers, it seems to me that some persons who were capable of giving rational advice in reference to the matter ought to have been consulted before the law was enacted. Now that is my opinion about the subject. (Applause.) As a prediction only I am willing to say that I do not think there will be found anybody who will be willing deliberately to kill a human being with this noble instrument. They may kill dogs, and persons may lose their lives accidentally in the street, but with set purpose and malice aforethought I do not believe it will be done. (Applause.)

The year just closing has been a great one electrically, and we hope to see its successor as full of progress and invention.

Joe Howard, the journalist, who, once upon a time, telegraphed several chapters of the Old Testament and called it war news, recklessly sings out as follows in his lively column in the N. Y. *Press:* "Take a daily lunch!" We will, we will, Brother Howard! Shall we call at 12.30?

Nothwithstanding the activity which besets all individuals at this favorite season in pursuit of souvenirs for the little ones—and big ones, too—the force in the REVIEW establishment have also found time to hearken to duty's call, and we are glad to be able to offer our readers an unusually interesting paper, brimful of electrical news, and valuable information. And having accomplished this somewhat difficult task, we wish our readers the same satisfaction in reviewing the past that we cannot help feeling—the satisfaction of successful performance.

OUR BOSTON LETTER.

(Special Correspondence.)

A new office has been opened by the Thomson-Houston Company, to be occupied by the department of isolated plants. A large room on the first floor of the Hathaway building, the second floor of which is already occupied by the other offices of the company, has been fitted up for the use of this new branch in the Thomson-Houston Company's business, which will be in charge of Mr. James R. Magee, assisted by Mr. Philip Richmond. The large office has a southern exposure and large plate glass windows give the best of light, while a private office affords a chance for the display of some beautiful examples of the electrolier manufacturers' art. The specialties of this department will be mill, factory and residence lighting, and in this latter work the possibilities in electric illumination for artistic effects will receive more attention than has yet been given to this important branch. Mr. C. B. Burleigh will have charge of the construction work, which ensures satisfactory results in that direction. Among the beautiful fixtures and electroliers already shown are duplicates of the fittings furnished the Prince of Wales for Marlborough House, and those installed for the Baron Rothschild, all from the manufactory of Laing, Wharton & Down, of London, the English correspondents of the T.-H. Company. Other examples of their artistic works are shown in the private office, where beautiful effects are obtained by the soft reflection of the incandescent light on the lacquered surfaces of these bronze and silvered fixtures. In the private office of Vice-president C. A. Coffin may be seen an exact duplicate of the reading lamp furnished for the Princess of Wales' reading table. It is of a beautiful conch shell design, and one of the best examples of what be expected in this line of work.

The Eco Magneto Watchman's Clock Company, of Summer street, have been doing a large business in their electric clock installations, last week's contracts including sales of clocks to Rice & Hutchins, Marlboro, Mass.; Parkhill Manufacturing Company, Fitchburg, Mass.; Hotel Flower, Col-

umbus avenue, Boston; Dr. Hammond's Hospital, Washington, D. C.; Louisiana Electric Light and Power Company, New Orleans, and H. E. Jacobs, Milwaukee, Wis. The Eco Company has also contracted with the Parkhill Company, Fitchburg, to install the Standard Electric Time system in the Parkhill mills.

Boston was the scene of a wedding on Tuesday evening, that will interest the electrical fraternity at large. Mr. Henry McLellan Harding, general manager of the Sprague Electric Motor Company, was united to Miss Florence A. Powers, daughter of Mr. C. E. Powers, of 275 Beacon street. Rev. Brooke Herford officiated, and a number of prominent people were present, among whom were Mr. F. H. Twitchell, of the Bath Electric Light and Power Company, Bath, Me., and Messrs. Sawyer and Blake, the New England agents of the Sprague Company.

Mr. H. E. Duncan, manager of the non-magnetic watch department of the American Watch Company, entertained a large audience at the Electric Club rooms on Wednesday evening with a paper on "Recent Problems in Watch Manufacture." Mr. Duncan alluded to the wonderful advance in electrical industries within the last few years, and its effect upon the watch manufacturers and their products. Little did they think at first that a condition of affairs would be reached when magnetism would be spoiling their watches and ruining their reputations. This condition of things created a new problem, the construction of a non-magnetic watch. A remedy has been found and the watch brought to a higher state of perfection than would have been were it not for this electric age. Mr. Duncan next went into the details of construction and special features of the non-magnetic parts, an account of which was recently published in these columns. The metals formerly used in these parts were brass and steel. It was clear that steel must go and a metal was found to take its place, so that to-day we have a non-magnetic watch that goes on faithfully even when surrounded by magnetic lines of force. At the close of the paper, which was illustrated by special pieces of apparatus and models gotten up particularly for the occasion by the American Waltham Watch Company, the subject was thrown open for discussion, which was entered into by Messrs. Rohrer, Ridlon, Squires, and others. Among the guests of the evening were Mr. Royal E. Robbins, treasurer of the Waltham Company, Mr. D. W. Eldridge, its chief inspector, and several others connected with the factory or Boston office.

The Wright Electrical Engineering Company has recently been incorporated and will have headquarters and open offices in this city. Mr. Alex. P. Wright has resigned his position of manager of the United Electric Light Company, of Springfield, Mass., to take the management of this new company, of which he is also a director, which proposes to design and build electric light and power stations and electric railroads. Conveniently located offices on the street floor are being fitted up on Federal street, and by the first of the year the company will be ready to undertake contracts. As plans, specifications and construction work will all be under Mr. Wright's supervision, careful and satisfactory work may be expected.

The Fitchburgh R. R. annual report expresses the satisfaction of the directors with the Westinghouse alternating system of incandescent lighting, recently put into the Hoosac Tunnel.

Mr. H. E. Duncan, of the Waltham Watch Company, leaves on Wednesday for Denver and the West. He will be absent several weeks.

Mr. George Cornwall, of the Hartford Dynamic Company, was a recent visitor at this office. Mr. Cornwall has been looking over the field hereabouts, with reference to the Hartford dynamic switch, now taking a prominent place in this line of apparatus.

Mr. Ralph Vose, formerly of the Edison Laboratory, has accepted a situation with the Thomson Electric Welding Company, at Lynn, Mass.

The song of the senior electricals, Institute of Technology—"We armature electricals."

The close of the year naturally invites a retrospective glance over the electrical field, and a noting of the advance made during the last twelve months. That an advance, and that of a very substantial character, has been made, can be proved to any doubting individual who will take the trouble to call on us and be shown some of Boston's representative electric interests, where in every instance progress and prosperity is evidenced on all sides. Increased accommodations, larger forces of assistants, new departments added, and a general appearance of thrift and enterprise, mark the year of 1888 as one of progress and advance in New England's electrical field, and fortell even better things for 1889. T. W. S.

Boston, Dec. 24, 1888.

THE ELECTRIC CLUB.

A Meeting of Unusual Interest—A Brilliant Gathering — Prof. Bracket Speaks on Important Questions —Leading Members Discuss Timely Topics.

The Electric Club is to be congratulated on the very successful meeting held Thursday evening, December 20th. This meeting heralded a change in the management of such gatherings, the lecture being delivered in the large double parlors on the first floor, and the assembly room on the second floor used for the purpose of serving a most excellent buffet lunch, free to all present, after the meeting adjourned.

At 8.30 o'clock the meeting was called to order by the secretary, in the absence of the president and vice-presidents, and Capt. W. L. Candee was, on motion of Dr. Moses, made chairman of the meeting.

Before the speaker was introduced, it was moved by the secretary of the Club, who stated that he expressed the official decision of the board of managers, that the matter of changing the dues of the Club, which was up for decision that night, be indefinitely postponed. This motion was unanimously carried. The limit of membership in the Club was then, upon motion, limited to 750; 450 resident and 300 non-resident members.

Prof. C. F. Brackett, Professor of Physics at Princeton College, was then introduced, and for two hours entertained and instructed an audience of 75 or 80 electrical men as is seldom their lot to be entertained. The professor spoke off-hand, in a remarkably clear, easy and rapid manner, and although starting out to speak but 30 minutes, as he announced, was kept answering queries from the many earnest electrical workers and students present, until that time had been occupied four times over, and still no one was ready to leave. Even after the chairman had announced that, in addition to the intellectual treat they had all received, an appetizing Electric Club supper was waiting to be attacked on the floor above, the audience remained to question and listen until another half-hour was valuably spent. The rapid speaking of Prof. Brackett—at times at a speed of 200 words a minute—taxed the Electric Club's stenographer, Mr. H. H. Sherman, of Mayor Hewitt's office, as even our eloquent Mayor had probably never done. The full address and discussion will appear in the electrical papers and published by the Club as soon as Prof. Brackett revises the stenographer's notes. We publish an abstract which will give our readers only an idea of the complete address.

The first subject that he presented before his hearers was the much perplexed question of a universal standard of electrical resistance. The electrical, and more especially the physical properties of conductors, received elaborate treatment. The fact was emphasized that it is out of the question to draw a wire that shall be of any given size, throughout its entire length, even if it be comparatively short, and that the conditions of manipulation during the process of drawing are such that uniform results are next to impossible.

Having clearly demonstrated that this must be so, and that every wire may be looked upon as made up of two inverted, truncated cones of great altitude, with their apices joined, he reviewed the experiments which have already been made by physical investigators in their endeavor to specify a wire which shall be of a standard resistance. The work of the special committee of the British Association for the Advancement of Science, appointed some years ago to look into this matter of standard resistance, whose report has been generally accepted, was next examined, and the speaker of the evening stated that this committee's definition of a unit of resistance was one that was surrounded with considerable ambiguity. This whole question of resistance was recommitted to them at the recent meeting of the Association, at Bath, England, and it is probable that a better understanding of the whole subject will result from their present efforts.

The next subject which was treated of by the lecturer of the evening was the general question of the electrical generation of light without the accompanying generation of heat. By a long and elaborate argument Professor Bracket led up to the final postulate that the phenomenon we call light is caused by vibrations in the ether transverse to the axis of radiation, and that they differ from the waves of electro-magnetic induction only in their length. Here the lecturer, without the aid of diagrams or blackboard, described the recent experiments of Hertz by which this postulate has become an established theory; leading his audience through the details of that elaborate set of experiments with such graphic language that they could almost see the field of force. His argument comparing the magnetic equipotential surfaces with the equipotential surfaces of the earth's gravity, leading up to the notion that the apparent straight lines of the earth's attraction are but *curved* lines of force (similar to the curved lines of magnetic induction) only with radii of *infinite* length, lifted his audience into a realm of thought not often enjoyed even by Electric Club audiences.

Then came a delightful speculative discourse from the opposite point of view, and his hearers were led to consider some of the phenomena which some day may be made manifest by placing a conductor, or possibly a non-conductor, in the field of polarized sunlight.

In the discussion which followed the address, Dr. Otto A. Moses called attention to the fact which is still the unexplained wonder of physicists, that many insects, our own firefly, and more markedly the *cucouya* of the West Indies, emit a considerable degree of light without any appreciable heat; and in this connection Professor Bracket stated that even the most delicate thermopile failed to detect in these luminous insects any manifestation of heat accompanying their luminosity. Upon being questioned by Mr. S. S. Wheeler as to what proportion of the energy now expended in work in producing the electric light, would eventually be used in artificial illumination, Professor Bracket stated he could make no reliable prediction, though he believed that light would eventually be produced with many thousand times less the amount of work, when we were able to produce just the vibrations necessary for light without the heat rays we now produce as a matter of necessity.

Mr. A. V. Garratt spoke of these experiments of Hertz being akin in their historical importance to the experiments of Young and Frinzel on the properties of light in the year 1801. A number of other speakers entered into the *conversationé*, which was prolonged until the pangs of hunger drove the assembled members and guests into the banquet room where the house committee had thoughtfully provided a thoroughly enjoyable repast.

CLUB NOTES.

Among the gentlemen present were: Prof. W. W. Jaques, Col. C. M. Ransom, Boston; Prof. Roberts, of Cornell; J. A. Powers, Troy, N. Y.; Spencer Gale, Chicago; Grosvenor P. Lowrey, Prof. C. H. Haskins, Jarvis B. Edson, C. W. Hunt, Leonard E Curtis, Chas. W. Gould, John C. Tomlinson, Chas. W. Spear, C. S. Bradley, S. S. Wheeler, Dr. A. V. Garrett, Dr. Otto A. Moses, Julian A. Moses, C. E. Stump, W. L. Candee, Lieut. F. W. Toppan, U. S. N.; Lieut. Tobin, U. S. A.; Gen. O. E. Madden, H. L. Storke, Thomas L. Scovill, Theo. Larbig, Major E. M. Hamilton, J. C. Nicoll, N. A.; George H. Yewell, N. A.; George T. Manson, George Worthington, Col. M. W. Goodyear, George B. Coggeshall, H. A. Reed, Gen. S. A. Duncan, H. H. Sherman, E. A. Colby, J. J. Carty, H. W. Seeley, M. M. Garver, Henry D. Hall, H. L. Lufkin, J. P. McQuaide, A. F. Stanley, John Stanton, A. L. Salt, and many others.

The magnificent collection of paintings that adorn the club walls was universally admired, and Art Committeeman E. M. Hamilton was highly complimented. Artists J. C. Nicoll and George H. Yewell were present. Two of the paintings of the former artists have already been purchased by a discriminating member of the club, one of which is to be loaned to the Paris Exposition, as part of the American exhibit there next year.

The buffett lunch, at 11 P. M., after the lecture, was a pleasant and successful feature of the evening, and was prepared and served in a style that did honor to Steward Hummell of the club.

Prof. Brackett was accompanied by Mr. Grosvenor P. Lowrey, the eminent attorney, and both gentlemen expressed their appreciation of the splendid home the electrical fraternity had secured, and was so progressively managing.

HIT AND MISS CHRISTMAS ELECTRICITIES.

To all our Contemporaries: The compliments of the season.

To the Electric Club: A merry Christmas and a happy, progressive and influential New Year.

To Professor Brackett: May your busy life be as full of electrical advancement in the future as in the past, and may the Electric Club be privileged to hear from you often.

To the National Electric Light Association: May the Chicago meeting be a great success, and may the organization meet with continual growth, and a New Year of great success.

To the Electrical Inventor: If you haven't sold that last patent for $1,000,000, don't be discouraged. Keep on inventing, and some day, you may be assured, you will be appreciated.

To the Newspaper Electrical Combinationites: You are having a good time writing interesting fiction. We wish you all the fun, and less economy of facts for the New Year.

To every electrical organization in the country that has the general good of electrical science at heart: The REVIEW wishes each and every one a Merry Xmas and a Happy New Year chock full of prosperity and good work.

To the Kind Donors: We are truly grateful for the favors sent us. The gift *via* Chicago, in which the fine hands of Telephone Sabin, Okonite Candee, and Brassport Stanley were evident, is remarkably suggestive of what may yet wind up their careers. (P. S.—It was a striped suit.)

The factory of the Thomson Electric Welding Company at Lynn is now nearly completed. The steam plant will be 500 horse power, and the equipments of the factory are to be very complete in every respect. The company are already placing machines upon the market, and orders are coming in from various parts of the country which will tax the new factory to its utmost. Machines are now building for welding extra heavy two inch iron pipe in less than two minutes, causing a perfect union of the abutting ends. It can be ensily seen that this will be of great value to manufacturers of artificial ice machines and others requiring tubing of extra lengths. The process is one in which speed and economy are both combined.

The action of the Metropolitan Electric Light Company in giving the order for their first central station to the Westinghouse Company, has caused some dissatisfaction on the part of English contractors, says *Industries;* but this feeling is likely to subside now that tenders for a second station have been invited, on the understanding that an English firm will receive the contract. The Metropolitan Company will thus be in a position to test by actual practical work whether the American or some English system of lighting is the best, and future orders will be given out according to the results of this test. The tenders now invited are for the whole of the generating plant (steam and electrical) required for the supply of 10,000 lamps, and for the transformers, but not for the mains.

*** A striking and original calendar has just been issued by Messrs. Hazazer & Stanley, electrical manufacturers, of 32 and 34 Frankfort street, New York. A picture of their popular dust proof bell is handsomely engraved in colors on cardboard, the calendar for 1889 being contained in the box of the bell. It is an artistic piece of work that will be generally sought for.

*** It may not be generally known that tropical Africa possesses a tolerably efficient telephone exchange. At St. Paul de Loanda, on the southwest African coast, different government departments, and most of the commercial establishments, are telephonically connected, the subscribers numbering about 100. From Loanada, also, a telegraphic line, manipulated almost entirely by the Angolense, extends as far as Dondo, on the River Quanza, 200 kilometres distant, and greatly facilitates business with the extensive coffee plantation in the interior.—*London Electrical Engineer.*

*** The long protracted negotiations in England for the amalgamation of the telephone companies are now making satisfactory progress, and there is a near prospect of the union of the United, National, and Lancashire. The conjunction is all the more desirable now that they are also within measurable distance of the metropolis, being coupled on to the great Midland and Northern towns. The difficulty of way-leaves has been overcome, but not without much trouble, land owners being found as opposed to the passage of telephone lines as they were in the olden time to railways. The distance to Birmingham is about 110 miles, and along about one-fourth of the road the wires are already up. Early in the new year this trunk line will be completed, and conversation may then be carried on with Birmingham, Leeds, Bradford, Manchester, Liverpool, and other commercial centers. Perhaps this contact with the North may induce Londoners to copy their provincial friends in the free use they make of the telephone.

A Decided Victory for the Telephone Interests of the Country.

THE MISSOURI SUPREME COURT DECIDES THAT ST. LOUIS CANNOT FIX MAXIMUM RATES—CHICAGO'S INTEREST IN THE CASE.

The Bell Telephone Company of Missouri scored a big victory in the Missouri Supreme Court, Thursday, December 20. About a year ago St. Louis passed an ordinance prohibiting the telephone company from charging more than $50 a year for an instrument. The charges at that time varied from $80 to $120. In behalf of the city it was argued that the city in its charter had received from the State authority to establish by ordinance the maximun annual charge for the use of telephones within the city. It was held that the statutory provisions relating to telephone companies do not, by implication or otherwise, repeal any provision in the city, nor impair the power of the State or the city to regulate telephone charges. No question was raised as to the power of the State to regulate the charges of a public corporation that makes use of public property to carry on its business.

The telephone company argued that the city did not have the authority to fix the rate, and the supreme court decided the same way. The issue will now be submitted to the legislature.

The dispatch giving the decision of the Supreme Court of Missouri was read with interest in Chicago, and it seems to be the impression in official circles that if St. Louis, under much more favorable conditions, cannot fix these charges, Chicago cannot. In speaking of the matter, Corporation Counsel Green said: "The city of St. Louis has by far a stronger charter than Chicago. It provides that the city has power to tax all businesses and corporations specifically enumerated, but the State legislature passed a general law regarding the use of telephones which, the supreme court held, revoked the powers of the city, and thus it was that St. Louis was beaten. The city of Chicago, as the matter stands at present, has no right to tax the telephone company by taking any portion of its earnings, and until the legislature passes a law giving us the power to do so, nothing can be done. I can see that the legislature will not give us that power, because the telephone company will agree to pay a general tax in all places, and as this would give additional revenue to the different towns, the members of the legislature would just ignore Chicago and let her howl. This has been done in Wisconsin, Ohio and Iowa. We are simply powerless."

Telephone and Telegraph System of Berlin.

The telephone service is admirable, as is testified by the public appreciation, there being over 10,000 instruments in use in Berlin. There are no private telephone companies in Germany, the telephone, like the telegraph, being a branch of the postal service. The price for telephone service is low, the annual charge for an instrument being 120 marks a year, or something less than $30, The long distance service between the principal cities of the empire is being rapidly introduced. By reason of the telephone being a part of the postal service, patrons are afforded many conveniences. A telegram received for a person who has a telephone is at once delivered orally from the central office, and the written message then forwarded by the local post. Likewise a telegram is transmitted by the sender to the telegraph office by telephone. The telephones in use are manufactured by Siemens, and, it is claimed, are an improvement upon the Bell patent, upon which they are based.

The efficiency of the German postal service, with its branches of telegraph, telephone, pneumatic tube and parcel post, is claimed to be a sufficient reply to the assertions that the convenience of the public cannot be so well met as by private corporations having control of the various means of intercourse. Postmaster-General Stefan is always on the lookout for opportunities of improvement, and is quick to seize upon any new means afforded by modern inventions for increasing the efficiency of the service. The Imperial postal museum in Berlin is a most interesting place to visit. Here can be seen models of all the various devices used in the service, as well as a valuable historical collection illustrating the history of postal intercourse from the earliest times. Postal administration is regarded in Germany as a practical science in itself, and no means is neglected to promote the interest of members of the service in its study. At the postal museum there is one of Edison's original phonographs, and a high official of the service told the correspondent that the department was anxious to secure one of the improved ones at the earliest possible moment, in order to see what use might be made of it in the department, and, if a good use is found for it, it will be put into application without delay. The pneumatic tube service of the Berlin post office for the quick delivery of letters, etc., is a great improvement upon our special delivery system. The pneumatic lines radiate out over the city from a central station, connecting various local stations at frequent intervals, so that a message is delivered between almost any part of the great city within half an hour.

The Pan-Electric Case.

THE ANSWER FILED BY THE DEFENDANTS.

In the case of J. Harris Rogers against A. H. Garland *et al* (known as the Pan-Electric case), the defendants, Joseph E. Johnston, Isham G. Harris, John D. C. Atkins, and Casey Young, at Washington last week, filed their answer. The object of the bill was to dissolve partnership, and for account of the Pan-Electric Company. Mr. Garland had filed an answer, but the others filed a demurrer, which some weeks ago was overruled by the court in general term, and leave was given to answer. This answer was filed by General Eppa Hunton. In it the defendants deny that they have failed or refused to perform any agreement with the complainant, and assert that they have endeavored honestly and in good faith to conduct the enterprise, and charge that the complainant has in every possible way hindered them. They deny that they have received any salary as officers. They assert that they have sold none of their stock, nor received a single dollar. If the court finds that there is any contract now existing, they join in the prayer for its dissolution. They deny that complainant has the right for any order for accounting, as he has sold all his interests as a stockholder.

Annual Report of the American District Telegraph Company for the Year Ending September 30th, 1888.

Capital Stock issued		$2,550,000 00
Capital Stock in Company's treasury		450,000 00
Total		$3,000,000 00
Cash surplus Sept. 30, 1886		$25,020 73
Gross earnings, year ending Sept. 30, 1887	$467,848 83	
Expenses.—Operating and repair of lines, $407,059.39; construction and reconstruction of lines, $7,591.48 Total	$414,650 87	
Net revenue from general service	$53,197 96	
Miscellaneous receipts from dividends, interest, royalties, etc.	17,519 60	
Total net revenue		70,717 59
Total surplus		$95,738 29
Dividends paid		73,500 00
Cash balance		$22,238 29
Bonds and stock in Company's treasury—		
22 bonds A. D. T. Co., Philadelphia, par value	$100 00	$2,200 00
700 shares stock A. D. T. Co., Baltimore, par value	5 00	3,500 00
1,760 shares stock District Telegraph Co., Boston, par value	25 00	44,000 00
250 shares stock A. D. T. Co., Cleveland, par value	20 00	5,000 00
1,750 shares stock Holmes' Electric Protective Co., par value	100 00	175,000 00
1,000 shares stock Manhattan District Telegraph Co., par value	100 00	100,000 00
Total number of miles of wire in operation		826
Total number of offices in operation		58
Total number of instruments in operation		19,051
Average number of employés, not including construction and messenger force		80
Average number of messengers		978

On May 1st this company purchased the capital stock, property and franchises of the Manhattan District Telegraph Company, of New York, paying therefor $150,000 of the treasury stock. This purchase absorbed one of the companies in active competition with this company, and resulted in a corresponding increase of its revenues, although the full benefits have not yet been felt, owing to the burden of a few leases which do not expire until May next, which made it impracticable to immediately cut off the entire expenses of that system.

This purchase has added to the company's facilities 232 miles of wire fully equipped for operation, and closed 21 competitive offices.

The condition of the property and service of this company continues to be maintained at an efficient standard, and is without debt.
Respectfully submitted,

THOS. T. ECKERT, President.

OUR PHILADELPHIA LETTER.

(Special Correspondence.)

Electrical matters were never in a more prosperous condition than they now are in our city. Our city councils, with unusual liberality, have increased the pay of the city's chief electrician. All of our electric light companies are full of business. The manufacturers of electric light apparatus are full of business, the manufacturers of electric appliances are all rushed with orders. The city is increasing its number of electric lights. All of our engineers and boiler makers are busy building engines and boilers for electric light purposes.

The Kensington Engine Company are putting in a novel light plant for the new Franklin Sugar Refinery. The plant consists of two pairs of Buckeye engines of 500 horse-power, on heavy self-contained bases forming integral parts of the engines themselves, thus caring for all the strain, and doing away with all necessity of foundations. This plant is situated over the top of the boiler house 65 feet in the air, carried on a heavy wrought iron floor. The engines drive to a line of shafting carried underneath cast iron housings. The dynamos, eight in number, of the Edison system, are supported on the top of these housings, and driven from the line beneath. The same company are also building four engines for the Brush Electric Light Company, for the addition to their plant at Baltimore, Md. This station already has six of the Buckeye engines, and when completed will have 16, with a combined horse-power of 45,000. They are also building the engines for the Camden Electric Light Company, at Camden, N. J., and will put in one of 350 horse-power, which will shortly be followed by another of the same size.

The Kensington Boiler Company are furnishing the boilers for the Camden Electric Light Company.

The Westinghouse Company have closed contracts for lighting the towns of Bristol, Pa., and Salem, N. J., through their agent, Mr. R. Muckle, Jr., of this city.

C. A. Bragg, of the United States Electric Light Company, closed the contract for lighting the new morocco factory of McNeeley & Co., of this city.

The Edison Company, through G. W. Silsby, are pushing the construction of their plants at Dover, Mt. Holly and Burlington, N. J. James E. Taylor, of Cape May, N. J., has been given the contract for the construction of the steam plants at the above-named places.

Mr. Stephen Holbrook, the electrical contractor, has removed his office from 55 South Fifth street to room 838 in the new Drexel Building. He reports business good, and has recently consummated a contract for a 1,000 incandescent light plant at the Collonade Hotel of this city. This is the Mather system. Griffiths & Company have charge of the construction work.

G. A. Wilbur has sold a plant of the Slattery induction system, 500 lights, at Danville, Pa. Owing to the fire at the Fort Jenney Electric Light Company's works, Mr. G. Wilbur will shortly leave this city for the West.

The Thomson-Houston Company, of this city, are full of business, and have sent to the Lehigh Valley railroad docks at Perth Amboy, N. J., 60 arc lights, and to the same company's shops at South Easton, Pa., 50 arc lights. They are now installing a 35 light arc plant for the Thomas Iron Company at Hokendauqua, Pa., and a 30 light arc plant for the Pennsylvania Iron Works at 50th and Merion avenue, West Philadelphia. They are at work placing three 35 light dynamos for the Mahanoy City Electric Light Company, of Mahanoy City, Pa., whose station was destroyed by fire about a month ago whereby they lost two 35 light machines. These with the sales of nine smaller plants, noticeably a 25 light dynamo for the Conshocken Electric Light Company, at Conshocken, Pa., and a small plant for use on one of the Ohio river boats, keeps them comfortably busy.

The 60 light Thomson-Houston plants for the new stores of Wood, Brown & Company and Young, Smith, Field & Company, of this city, will be running before the end of the month.

Tracy, Hayne & Company, electrical contractors, of this city, are very busy. The Mayo dynamos, of which this firm are the agents, are now running at the Windsor Hotel on Filbert street, this city, supplying 500 lights and giving entire satisfaction. This is the first Mayo dynamo in this city.

Partrick & Carter, of 114 South Second street, are rushed with orders for electrical appliances of all descriptions, and meeting with great success with their communicators, and have fitted up a number of new cars for the Baltmore & Ohio R. R. with these annunciators.

The Sprague Electric Railway and Motor Company, whose office is in the new Drexel Building, report that they are receiving numerous inquiries for electric motors, and when the new Edison plant starts up expect to be rushed with orders.

Mr. W. A. Stadelman, the special agent for the Sprague Company, has just installed an electric light plant at his residence at Bala, Pa.

The Electrical Construction Company, of South Seventh street, have recently installed a small plant, and are estimating on several larger ones. They are also doing considerable repair work and have some big jobs under way. Their trade is constantly increasing for electrical supplies, and prospects with them are very good.

C. M. Rhoades, of 137 North Seventh street, is meeting with great success with the Edgerton vapor motor engine for running dynamos, etc.

The Salem Electric Light and Power Company has been organizing at Salem, N. J., with the following officers: President, John M. Carpenter; vice-president and manager, A. H. Rennie; secretary and treasurer, George H. Carpenter.

The electric lighting system at the Pennsylvania railroad shops at Pavonia, N. J., has been completed, both the arc and incandescent systems being used. I. M. D.

Philadelphia, Dec. 18th, 1888.

The Western Union Takes a Bold Stand against the Union Pacific.

Since it has become generally known that the Union Pacific Railway Company proposed opening its own telegraph system between the Missouri river and the coast, the Western Union Telegraph Company has made an effort to defeat it.

In the United States Circuit Court last week the Western Union through its attorney, Judge J. M. Woolworth, applied for an injunction restraining the Union Pacific people from taking any decisive acts in derogation of the contract now existing between the two corporations by operating its own line. The Western Union claims that it has recently heard that the railroad company was contemplating violating the contract, and would, at an early day, seize the lines between Kansas City and Denver, and those between Omaha and Ogden; also, that it would take the wires now used by the Western Union, or some of them, as well as those used by itself, and cut them from connection with the complainant's offices and run them into its own offices for commercial and other business. The Western Union also avers that the railway company will exclude its operators and employés from its offices; that the telegraph company's business will be greatly impaired by depriving it from the gains and profits, which amount to much more than $100,000 a year.

The bill of complaint filed by the Western Union is quite voluminous and sets forth the history of either concern and how they were organized under acts of the legislature. In one section of the bill the orator recites that the defendant has built several branch lines of railroad of considerable length, extending into regions sparsely populated and furnishing very inconsiderable business, since their contract was made. The railway has from time to time called upon the telegraph company to build lines and the requisitions were honored and the work performed along such roads, which lines do not yield any considerable revenue. The Western Union has 500 miles in aggregate length and is still farther extending its lines. It has strung three wires from Omaha to North Platte, and two beyond that place for the use of the railway. In the work mentioned the company has expended $387,272.14, and has been reimbursed in part in the sum of $121,603.17.

The orator avers that the wires used by Union Pacific in the operation of its road are not equal to its necessities in that behalf, and it is impossible for the railway to do any business for the public or other companies on its wires without seriously interfering with and impeding the operation of its engines and trains. If the company undertakes to do this it will be under the necessity of using the Western Union's wires, upon which, it is claimed, is carried on almost the entire transcontinental business of the Union. As this is the case the telegraph people cannot submit to any interference by the defendant without seriously impeding and disarranging its business to the great loss and inconvenience to the public.

It is affirmed that the railroad company justified such proposed action of seizing the lines and using its own service by the command and injunction of an act of Congress to aid in the construction of a railroad and telegraph line from the Missouri river to the Pacific ocean, and to secure to the government the use of them for postal, military and other purposes; also the act of July 2, 1864, and other acts amendatory thereto, approved August 7, 1888. Thereupon Norvin Green, President of the Western Union, addressed a communication to the president of the Union Pacific remonstrating against the contemplated action and insisted that the provisions of the act be observed until its validity should be judicially ascertained and determined. To which letter the president of the Union Pacific made answer that the road will not comply with the request, but would maintain its own telegraph and employ its own operators. Without waiting to make an adjustment of its relations the Union Pacific Company removed the superintendent of telegraph on December 2 last, without consulting the Western Union.

In conclusion, the orator claims that the Union Pacific is not within the act approved August 7, 1888, and its injunctions and prohibitions, forasmuch as it never owned the lines of telegraph along its road between Kansas City and Denver, it entered into an arrangement whereby it became and was and is absolved from all obligation to maintain and operate the line between Omaha and Ogden.

For these reasons the Western Union wants a restraining order. The case will be called at Leavenworth, Kans., December 27.

Upon Telegraphy and Other Electrical Inventions at McGill University.

Mr. F. N. Gisborne, of Montreal, delivered an interesting lecture at that place in the William Molson hall, on Friday evening last. Sir Wm. Dawson remarked that Mr. Gisborne had first studied telegraphy at Montreal over 40 years ago, and, as many present were aware, was entitled to the credit of being the projector and practical prime mover in transatlantic cable enterprises.

Mr. Gisborne then informed his hearers that his desire was not to entertain those present, but to so clearly explain the first principles of telegraphy, telephony, the localization of breaks in ocean cables and lighting, that every person present might leave the hall with a satisfactory knowledge of the basis of modern electrical apparatus and inventions, and that as the movements in instruments were too minute for observations in a lecture room, he had prepared diagrams upon so large a scale that they would be visible to the audience at large. By these diagrams the needle, or Cook & Wheatstone's English telegraph, the magnetic, or Morse & Vail American telegraph, the Bain, or English chemical and fac-simile telegraph, the Wheatstone automatic and step-by-step telegraph, the Bell telephone, the localization of cable breaks and the dynamo with its application to arc and incandescent lighting, were explained verbally and entirely without notes, in such simple and non-technical language as to call forth repeated applause from all present. At the special request of Sir Wm. Dawson, Mr. Gisborne referred back to the year 1859, when he, in conjunction with Dr. Whitehouse, had, with Sir Edmund Head as chairman, Sir Allan McNab, Harvey Lewis, M. P. for a London constituency, Lord Bury and other men of note, as directors, endeavored to establish direct cable connection between England and Canada *via* the straits of Belle Isle, and that some years later the Hon. John Young, of Montreal, and other friends made a like unsuccessful attempt to obtain the required capital. He was happy, however, to state that another attempt, under the primary auspices of well known Canadian capitalists, was about being made, and that he believed the Dominion Government would regard such a movement with favor.

A New Telegraph Register.

The Western Electric Company's (New York) continuous register is designed to produce, in a convenient form for filing and reference, a complete record of all messages sent over a Morse circuit. It is believed that in many branches of the service such a record will be well-nigh invaluable. In place of the single line tape used with the ordinary register, a continuous band of paper has been adopted, six inches in width and, when doubled, nine feet in length. On this band or belt the Morse record is inked by the instrument in an unbroken spiral line, the lines being about one-eight of an inch apart. A day's business of the busiest of railroad lines may be thus recorded on a double band of paper nine feet in length which may then be folded and placed on file. With the old style of register such a record would cover about 1,000 feet of tape and would be practically inaccessible for reference.

The register is self-starting and self-stopping on either an open or a closed circuit. It needs no attention except to remove the record at a stated time each day, replace the paper, and supply ink to the pen.

A working model of this instrument was first exhibited at the convention of the railway telegraph superintendents at the Murray Hill Hotel in July, where it received general commendation. Since that time several improvements have been added, and in its perfected form it has recently been placed on the market. We present a view of it in this issue.

NEW CONTINUOUS TELEGRAPH REGISTER.

Dr. Parker Endorses Mr. Moses' Experiment.

TO THE EDITOR OF ELECTRICAL REVIEW:

I read in your journal of December 15th, 1888, Julian A. Moses' most interesting letter, describing his ingenious experiment, the result of which seems clearly to sustain his theory and explain the curious phenomenon noticed when the lantern slides were shown at the Electric Club. Mr. Moses has conformed to all conditions noticed, and his photograph sustains his theory. I thought at first his use of brass in place of copper or iron might be criticised, but as he calls attention to the phenomenon and his solution of it, it seems easy to prove both (unless one's eyes deceive them), for by holding a brass, copper or iron wire (even a wooden pencil will answer), before a flame of gas or oil, one will see "the reflection of the light around the wire," cutting out more or less at the brightest point, on both upper and lower sides of the wire, whether it is wet or dry, more marked when the wire is wet.

Respectfully yours,

M. G. PARKER.

Lowell, Dec. 17th, 1888.

TELEGRAPHIC

.... The Western Union Telegraph Company are laying their cables at Buffalo in Wycoff tubing and creosoted plank, manufactured at Williamsport, Pa.

.... It is stated that Electrician Burke, of New York, has so far perfected his new system of cable transmission as to attain a speed of 27 words per minute on the short end of one of the direct cables. Mr. Burke has given this subject his undivided attention for many years, and it is the opinion of a cable expert that he has at last succeeded in attaining the desired object. He proposes to substitute Morse signals in place of the work performed at present by the mirror and recorder instruments.

Practical Electrical Measurements.

A valuable publication from the pen of Mr. (or Prof.) J. Swinburne, has just been issued with the above title. As stated in the preface, it is the intention of the author to write about electrical measurements in the workshop as opposed to mere laboratory practice, and in this the book enters a field of usefulness which entitles it to the attention it will undoubtedly receive. The different instruments in use are somewhat critically discussed and their merits or faults, if they have any, pointed out. In this matter such points as accuracy in ordinary use, portability or cheapness, are considered as of more importance than absolute accuracy under laboratory conditions. Another point which will be appreciated by a large class of readers, is the avoidance in this work of mathematical symbols, without any detriment to its scientific value. The book is largely a reprint of articles from the columns of the London *Electrical Review*, carefully revised and rewritten, and makes no pretence to originality except in some of the methods and arrangements described, but bringing as it does so much valuable and practical information into a compact and convenient form, it cannot fail to be appreciated by a large class of readers. ["Practical Electrical Measurement," illustrated, by J. Swinburne. London: H. Alabaster, Gatehouse & Company. New York: D. Van Nostrand, 1888.]

Traffic Receipts of Some London Companies.

The directors of the Brazilian Submarine Telegraph Company (Limited) have declared an interim dividend of three shillings per share, or at the rate of six per cent. per annum, tax free, for the quarter ended September 30, payable on the 24th inst.

The number of messages passing over the lines of the Cuba Submarine Telegraph Company during November was 4,013, estimated to produce £3,100, against 3,343 messages, producing £2,998, in the corresponding month of last year. The traffic receipts for August, estimated at £2,800, realized £2,860.

The traffic receipts of the Eastern Telegraph Company, for November, amounted to £59,862, against £53,454 in the corresponding period of 1887; and those of the Eastern Extension, Australasia and China Company, for November, were £45,234, against £39,000.

The estimated receipts of the West India and Panama Telegraph Company for the half-month ended the 30th of November, were £2,889 as compared with £2,689. The August receipts, estimated at £5,002, realized £5,149.

The receipts of the Great Northern Telegraph Company for November were £24,000, making a total from January 1 of £250,200, against £242,880 and £239,000, for the corresponding periods of 1887 and 1886, respectively.

Prof. N. S. Keith has put a 30 horse-power electric motor in Payne Bros.' Bolt Works, and a 12 horse-power motor for the Union Iron Works, San Francisco.

The San Francisco, Cal., *Lumberman and Contractor* says: The use of electric motors is making rapid headway in the shops of this city, and the time is not far distant when this will largely supersede other forms of power motors.

It seems that some of the electrical lighting apparatus aboard the new war-ships, having been illy prepared and inefficient, is to be taken out and better quality put in its place. Some bold man might suggest that their engines be taken out at the same time and faster ones substituted, for, as is conceded, the new ships now afloat are slow as well as unarmored. They can neither fight nor run away.

The new and extensive factory of the C. & C. Motor Company will have all its power furnished by electricity. This indicates a proper appreciation of its own goods, and is a clear case of the physician believing in his own prescription, and healing himself with it. The excellent management of this company, backed by the excellence of its motor, is winning it most abundant and deserved success.

Workmen began putting down the conduit for the Fulton street (New York) electric railway last week. The conduit will carry the wires which are to furnish the motive power for the cars, and has been placed between the tracks on the crown of the street. As there is only one excavation for the two lines of conduit, traffic is not hindered, and work can proceed rapidly. The conduit has been laid for a distance of 100 feet east of Broadway, and unless there should be a hard frost the workmen will make rapid progress.

The Eddy Electric Company, of Windsor, Conn., now represented by Messrs. Dickerman, Adams & Co., of Boston, well-known men in the electrical field, has opened its new office in the magnificent Hathaway building, 620 Atlantic avenue, Boston, where it proposes to do all kinds of electric contracting, and furnish all kinds of electric supplies. This company has lately installed a three horse-power Eddy motor for Beals, Higgins & Henderson, corner Washington street and Temple place, running a Lamson cash system. The Lamson Company has adopted this motor for all cases where they can use electric power. They have also placed a one horse-power motor for C. N. Brown & Co., machinists, 63 Harrison avenue, and one horse-power for T. W. Ripley, printer, 80 State street. This motor is running three Kidder jobbers and a 30 inch Sheridan paper cutter.

Beattie Zinc Amalgam for Battery Purposes.

It is claimed for this battery that the union of zinc and mercury has proved its superiority over commercial zinc for electrical use. In the tests made for comparison with the ordinary metal an average of two per cent. of electro-motive force in favor of Beattie's patent is said to have been developed, 31 per cent. (?) advantage in point of reduction of internal resistance, and an average advantage of 18 per cent. by weight in the consumption of metal. It was claimed, also, that the use of the new metal delayed polarization, and that the cells recuperated, after short circuit, much more rapidly than did those containing commercial zincs.

The Grand Theater at Islington, which was burnt down nearly a year ago, has now been rebuilt, and is lighted electrically.

Telephone Rates in New Jersey.

The president of the New York and New Jersey Telephone Company, Charles F. Cutler, says with reference to the report of an expected telephone war in Orange, N. J.: "The rates are not going to be raised to present subscribers for telephones in Orange, they will remain the same as they have been, namely, $50 for a telephone in a private house, and $65 for one in a store or other place of business. But the rates therefor to new subscribers will in future be $60 and $75. Those who don't like to pay these rates will have to go without telephones. The reason for the increase is that we have now about 500 subscribers in Orange, and that is as many as we can serve profitably at the present rates."

SOUTHERN ELECTRICAL NOTES.

(Special Correspondence.)

A movement is on foot to put electric lights in Marietta, Ga. It is being talked up by the agent, who proposes to put in the plant for $12,000, giving the city 125 lights for $1,800, and a similar number for commercial purposes at an agreed rate. There is good prospect for its being done.

Mr. Alex. Stephens, one of the most popular members of the Western Union Telegraph force, at Augusta, who makes many friends wherever he goes, has come to Charleston, S. C., and he will accept a position in the office here.

Ground has been broken in Charlotte, N. C., for the enlargement of the station of the Thomson-Houston Electric Lighting Company's plant. The entire front of the old building will be taken out, and the new one will be modeled from the latest designs, making the building and its contents one of the attractions of the city. A new plant for the incandescent system will consist of two dynamos, a 120 horse-power engine, and a 125 horse-power boiler, which is sufficient to run 250 incandescent lamps, not including the ones now in use. The whole addition is to be made at an expense of $15,000.

The Phœnix Electric Company, of Marshall, Tex., has been chartered. Capital stock, $25,000.

An electric light company has been organized at Paris, Ky.

At Newport, Ky., an electric light company has been chartered, with a capital stock of $50,000.

At Birmingham, Ala., the Southern Electric Company has been chartered. Capital, $10,000.

Capt. Henry & Son will soon erect an electric light plant at Versailles, Ky.

The Postal Telegraph Company will build a line from Washington to New Orleans, La., and place officers at the principal cities on the route.

At Summerville, S. C., an electric railroad company has been organized.

The Electric Light and Power Company, of Knoxville, Tenn., have purchased $10,000 worth of new machinery for their plant.

The Electric Light, Power and Manufacturing Company, of Dallas, Tex., will put in an additional dynamo, with a capacity of 50 arc lights.

Bids for lighting the city of Fort Worth, Tex., by electricity, will be received until January 1st. Bids will be for 200, 300 and 400 lights.

At Lampasas, Tex., a company is forming to erect an electric plant for both arc and incandescent lights.

The Electric Street Railroad Company, of Lynchburg, Va., expect to have their system in operation by spring of 1889.

The Waterhouse Electric and Manufacturing Company, of Birmingham, Ala., have sold their 40-light arc and incandescent plant to the Florence Electric Light and Power Company. E. A. O.

Charleston, S. C., Dec. 17, 1888.

At a meeting of the Court of Common Council, held at the Guildhall, London, the chairman of the City Commission of Sewers stated that they had taken the advice of Mr. W. H. Preece, and of Col. Heywood, their engineer, and that an agreement had virtually been come to regarding the manner in which tenders for the electric lighting of the city should be invited. It was stated that every important electric lighting company would be asked to tender.

OUR KANSAS CITY LETTER.

(Special Correspondence.)

The Kansas City agency of the Thomson-Houston Company reports business active and increasing. The contracts closed include the suburban electrical railway at Wichita, Kas., which has been completed and is in working order, and the electrical railway which the Metropolitan Street Railway Company of this city has secured a franchise for in Armourdale. The line is about two and a half miles long. The overhead construction will be arranged with the operation of 20 cars in view, but only five will be put on at first. If the road is a success and is well patronized, the entire 20 will be put on. The same agency has closed a contract for a 300 incandescent light plant for the buildings and grounds of the Soldiers' Home at Fort Leavenworth, Kas. At Anthony, Kas., an electric light company has been formed and it has given this agency the contract for a 35 arc light plant. The Emporia (Kas.) Gas Company gave the T.-H. agency a contract for a 50 arc light plant. Here in Kansas City the agency has sold a 50 incandescent light plant to O. W. Ditsch who has disposed of it to a business firm.

The Interstate Company with its storage batteries is attracting much attention since it got into its new quarters. Superintendent Bossart is a hustler, and he is backed by an active company, both working in harmony, and the result is a business bigger than they can take care of. They have their central and fire sub-stations all in working order now. The big dynamo made especially for the company by the Detroit Electrical Works, and used for supplying the sub-stations, operate finely, giving perfect satisfaction.

The Edison plant building of the Kansas City Consolidated Electric Light Company is far from completion. All the contractors are behind with their work. The building was to have been completed and the plant in operation by November 15th. Privately, Superintendent Weeks declares he will be satisfied if the plant is in operation by February 12th, the date for the assembling here of the Edison Electric Light Association. But his heart is set on having the plant in operation then, and if it is not the blood of contractors, great and small, will flow in copious streams. The iron men have more than their share of the responsibility for the delay. They are unable to get the iron beams, and that delays the work of the masons and of course the carpenters, and in the meantime the machine men are waiting on the builders. The iron men claim that it is an absolute impossibility to secure the beams on time, as they are controlled by a monopoly which not only fixes the price but the amount of the product.

The Edison convention, which will be held here on February 12, will be one of the biggest conventions ever held by that association. Mr. Weeks, who has charge of the arrangements, says every effort will be made to have Mr. Edison himself attend. It is expected that the convention will receive much attention from the city on account of the big electrical interest here, besides the great attention electricity has received from the citizens generally.

The Kansas City, Kas., Electric Light Company has started injunction proceedings against the Kansas City, Mo., Electric Light Company, to make it keep its poles down. When the Missouri company was established it placed a few lights in Kansas City, Kas., as the special request of the citizens, obtaining a franchise from the then separate towns of Wyandotte, Kansas City, Kas., Armstrong and others, all of which have since consolidated and are known as the one city, Kansas City, Kas., and this one city is the one that has granted the Kansas company a franchise.

The Kansas City Consolidated Electric Light Company, besides building and equipping the Edison plant, is also considering and really taking material steps toward enlarging, almost doubling, in fact, its arc and alternate current incandescent plant at Eighth and Santa Fé streets. W. B. Grimes, president of the company, has purchased for the company the two lots adjoining the present plant, increasing the frontage of the property on Santa Fé street 50 feet. A proposition to rate bonds for $100,000, bearing six per cent. and payable in ten years, has been submitted to the stockholders of the company and will be voted upon by them on December 17. This is to be used for improvements, and nothing is more probable than that the money so obtained will be used in building this addition, although the company's officials speak of the addition as a matter to be really decided upon next spring.

W. B. Grimes, president of the Kansas City Electric Light Company, has received a proposition from eastern capitalists to build an electric railway on the "loop." Mr. Grimes has been endeavoring to form an independent company for this purpose, but as there are about a dozen different individuals and street railway corporations that want to build the "loop" railway, he has not been able to make much headway so far.

The Kansas City and Blue Valley Railway Company has been incorporated, with a capital stock of $500,000 to build a standard gauge railway from here to Independence, Mo. The motive power has not yet been decided upon, but if they find electricity practicable they will use that in preference to all others. Dr. Morrison Munford, editor and proprietor of the *Times*, Thomas J. Green, L. E. Davidson, E. M. Holmes and A. D. Leech are the directors.

One of the biggest electrical deals ever made in the West was closed the other day by a telegram from New York to St. Joseph stating that a New York syndicate had agreed to the terms for the purchase of the Citizens' and Frederick Avenue Electric Railways in St. Joseph and also the electric light company's plant. Joseph A. Corby, who engineered the St. Joseph end of the deal, has gone to New York to tie up all the loose ends of the transaction. Before he departed he said that the purchasing syndicate would extend both lines in several directions, put in 10,000 incandescent lights and arrange for supplying electric power. A five story building, 80x140 feet, would be erected and be made the station for the arc light plant, the power house for the railroads. The Sprague Motor Company and the Edison Electric Light Company has secured all the electrical contracts let by the syndicate. It is also stated that the syndicate will endeavor to secure the whole or at least a controlling interest in the Wyatt Park electric railway.

KAWSMOUTH.

Kansas City, Mo., Dec. 15.

Connecting the Sandwich Islands by Cable.

We learn that the Bishop Gutta Percha Company is making for the Hawaiian Cable Company the longest submarine cables ever made in this country, to be used in connecting the principal islands of the Sandwich group by telegraph. The first cable of 40 miles will be completed about the 1st of January, and will require four large cars to transport it across the continent. The "Hawaiian Cable Company" has a government concession for connecting all the important towns on the islands. They expect to put up about 50 miles of land lines and to lay the 40 miles of cables immediately, and to complete the whole system within a few months. Movements are on foot to connect the islands by telegraph with our shores and also with New Zealand.

Manufacturing Notes.

The business of the Sioux City Foundry and Machine Works is rapidly improving, and the prospects for the winter's trade are very flattering. Among the recent sales which they have made, we note two of their 75 horse-power Corliss engines for the *Pioneer-Press* building at St. Paul, Minn., also two 75 horse-power Corliss engines for electric lighting purposes, one of which goes to James Bell, David City, Neb., and the other to the Storm Lake Electric Lighting Company, Storm Lake, Iowa. These consisted of complete steam plants. The first of the new line of sizes, a 10x16 of Giddings' single valve automatic engines, was sold some time since, together with a boiler, to go to the Chillecothe Water, Gas and Electric Light Company, Chillecothe, Mo. This will be tested at the works, and forwarded to its destination at once. They have also a large force of pattern makers at work bringing out a full line of sizes of this justly popular engine, which is known at the East as the "Russell" automatic, and which is enjoying such a trade that it is difficult for the original builders to keep up with their orders. In addition to this, the Sioux City Engine Works have recently sold several large boiler plants with a number of combined outfits of the Erie Engine Works manufactured by Cleveland & Hardwick, of Erie, Pa., for which they are Western agents.

Shocking Snakes with Electricity.

A German paper reports that a novel use of electricity has been made in India for the prevention of the intrusion of snakes into dwellings. Before all the doors and around the house two wires are laid, which are isolated from each other, and connected with an induction apparatus. Should a snake attempt to crawl over the wires, he receives a shock of electricity which either kills or frightens him into a hasty retreat.

Pittsburgh Electrical News.

The contract for the lighting of the city of Pittsburgh, received by the East End Electric Light Company, has caused a boom in the affairs of the Westinghouse Electric Light Company, which will supply all the apparatus necessary for supplying the lights. As President Rowand, of the contracting company, will push the work rapidly, the Westinghouse Company will be kept quite busy making necessary machinery.

There was reported, says the Pittsburgh *Dispatch*, a statement to the effect that the entire works of the Westinghouse Electric Company would be removed to New York, and that the manufacture of the machinery would be removed there with improved facilities. Attached to this rumor was one that Mr. Westinghouse and some of the gentlemen of the Philadelphia company had organized an electric street railway company, and would operate it with the Telsa motor.

When a reporter called at the office of the electric company, Vice President H. M. Byllesby said that it was a mere rumor, and said that the officers of the company were too busy to pay any attention to rumors.

At the office of the Philadelphia Company a meeting, or rather consultation, about the city lighting contract was held, and after it was over Mr. Westinghouse was seen by a *Dispatch* reporter. The gentleman read a clipping from an evening paper, and said:

"We have in contemplation the removal of our lamp factory to New York, because we have a large building there, and by using it we would be afforded better facilities than we have in our works in this city. Concerning the Tesla motor, all we have to say is that we are making them for anybody who wants to buy them, and I don't know anything about the reported street railway.

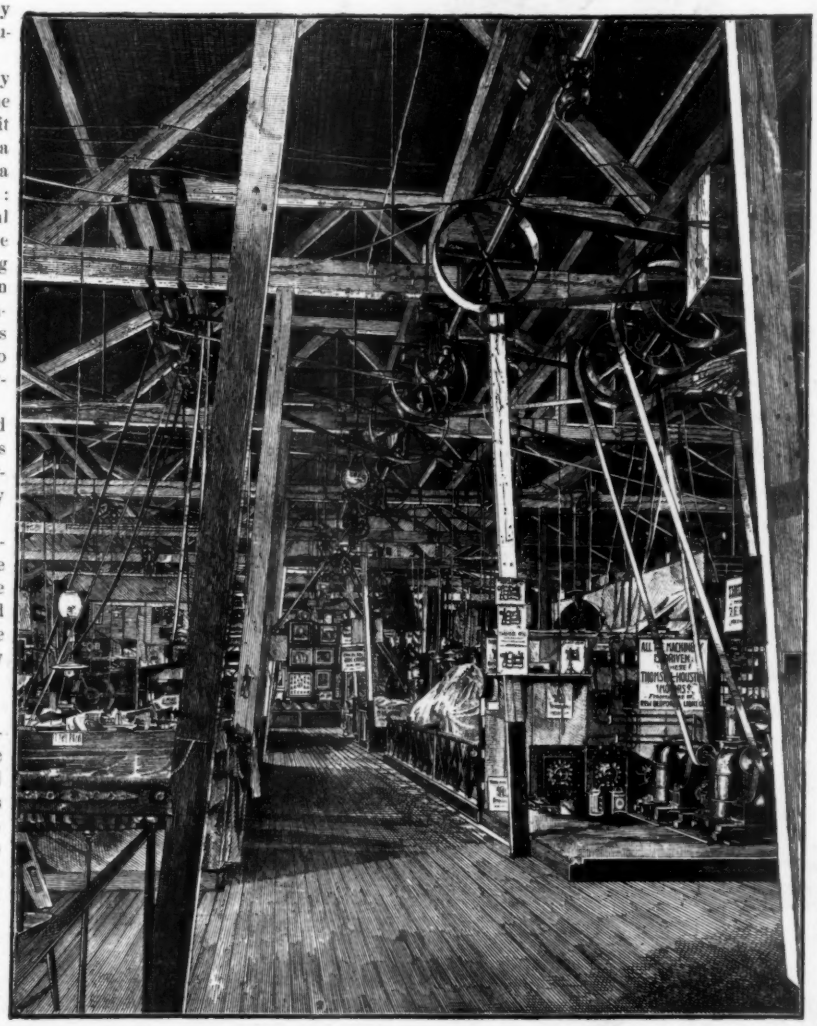
"On our New York property, we could manufacture from 15,000 to 20,000 lamps per day besides the greater economy of having all our works under one roof. We may remove in the spring."

The street railway end of the report doubtless originated, the officers think, from the statement published some time ago, to the effect that a model of an electric road would be built around the works in order to give the motor some severe tests, and more fully establish its power.

Mr. F. J. Parsons, in an informal talk before the Boston Electric Club recently, gave some interesting details about steam and electric practice in Germany. Gas engines are used to a much greater extent than in this country, for a gas motor can be put up anywhere without especial permission from the authorities of the German cities, and without increasing the insurance rates, while it is sometimes quite difficult to get permission to put up a steam engine. In the business portion of Berlin, it is only on the promise of taking the most extraordinary precaution to deaden the sound and to prevent accidents, that one can get the necessary permission from the city authorities. In the Berlin electric light station they use smoke consuming furnaces, so there is no disagreeable smoke. All the foundations of steam engines and dynomos are carefully isolated from the foundations of the building itself, to prevent the inevitable vibration of the high speed engines from being conducted to the walls of the building. The pulleys are covered with leather to deaden the sound of the running of the belts, and the exhaust steam is carried off so that you do not hear that characteristic sound; so that even standing on the floor directly over the engines it is impossible to tell whether they are in motion or not. The wires for the Berlin service are run underground, and the construction is of the most expensive kind. In order to determine with accuracy the sizes of the cables to be used in the different streets, a miniature working model of the entire plant is maintained, and by the use of resistances corresponding to the different numbers of lamps, experiments are made to determine the size and location of the feeders.

Board of Trade Exposition at New Bedford, Mass.

While it has been often said that in time the electric motor receiving its current from a central station would supplant the steam engine, it is seldom that it is seen done as shown in the accompanying drawing. In cases like the present one, there would usually be found a large steam engine with the accompanying boiler for furnishing power instead of the electric motor. One especial advantage which is particularly emphasized by an installation of this kind, is the utter freedom of the motor from all the objectionable features of heat, noise, dust and dirt, which must necessarily accompany an isolated steam plant, making it necessary to locate the engine and boiler with reference to these points. Another point, too, is the expense of setting up and removing a motor power plant is much less than it would be for a boiler and engine. The cut shows the exposition of the Board of Trade, of New Bedford, the entire power for the exhibits being furnished by the two Thomson-Houston motors.



NEW BEDFORD EXPOSITION ELECTRIC MOTOR POWER PLANT.

—— The Toronto, Can., Electric Light Company are at work perfecting a system of street and house lighting whereby lights of any candle-power, from 16 to 200, may be run at the same time and to any distance. The company expect to make a tariff that will be favorable to consumers.

—— Considerable competition exists among the Aldermen of Brooklyn in the matter of securing electric lights for their respective districts, and the question has arisen as to whether there is sufficient money in the fund set aside for electric lighting to pay for all the lights that have recently been asked for. On this point Alderman Murphy held, when questioned, that up to the present the amount on hand was amply sufficient to meet all current demands. It was then decided to put up electric lights in Carroll street, from Smith street to Fourth avenue; Baltic, from Court street to Fourth avenue; Myrtle street, from Knickerbocker avenue to Myrtle avenue; and on Wythe, Grand, Franklin, Washington and Carleton avenues, also on Pacific street.

—— The city of Anoka, Minn., wants proposals for street lighting by electricity. The chairman of the lighting committee may be addressed.

—— The Webster, Mass., Electric Company has bought a controlling interest in the Webster Gas Light Company. The company will enlarge their plant immediately, so as to have a capacity for 80 arc and 500 incandescent lights.

—— A company is formed in Dover, N. H., to build an electric railroad over some of the principal streets of the city of Dover, and to Berwick, Me., and through the village of Great Falls. The money necessary for this project is already raised, and the projectors are only waiting for a charter.

—— The directors of the Cambridge, Mass., Electric Light Company held a special meeting last week, and voted to increase their capital stock from $100,000 to $200,000, and to put in five 125 horse-power boilers and a 500 horse-power condensing engine. The company is doing a rushing business.

—— The Providence, R. I., Merchants' Exchange is now equipped with a cable cash system, the only one of its kind in the State. It is operated by an electric motor, and the rapidity with which the little cash boxes fly over the cord, up stairs and down stairs, right and left, straight ahead, around corners, and every way possible, until the cashier's desk is reached.

—— At the meeting of the Manchester Electric Light Company, last week, it was voted to increase the capital stock to the extent of $20,000 and to authorize the board of directors to issue bonds to an extent not exceeding $80,000, in order that the company may be able to carry out its contract with the city. It is estimated that the plant for manufacture of the light must be increased to about 400 horse-power, as about that number of lights will be in use, and it takes nearly a horse-power to run a single light. The personality of the board of directors will be changed at a future meeting of the company.

ELECTRIC LIGHT NEWS

—— Biddeford, Me., has ordered 14 additional 1,200 candle-power lamps.

—— Philadelphia, Pa., is to have additional electric lights, to cost $31,000 a year.

—— The San Bernardino, Cal., Electric Light Company has sold its plant to the Gas Company.

—— The aldermen of Fort Worth, Tex., are wanting proposals for public lighting by gas or electricity.

—— The council of North Manchester, Ind., decided to have an electric light plant, to cost $1,000 per annum.

—— A committee has been appointed to consider a plan for lighting the town of Sherman, Tex., by electricity.

—— The Edison Illuminating Company, of Brooklyn, are making preparations for opening the streets for laying the wires.

—— Mr. Ennor, electrician at the Spreckels Beet Factory, is endeavoring to arrange for an electric lighting plant for Watsonville, Cal.

—— The Hawkeye Electric Manufacturing Company, recently organized, will apply for a charter at once, in order to commence business.

—— The city council of Kalamazoo, Mich., have renewed the contract with the local company which has been furnishing light heretofore to the city.

—— The Waterhouse Electric Light Company, of Hartford, were awarded a medal for superiority on their system exhibited at the American Institute Fair, in this city.

—— It is reported that a combination of all the Edison electric interests is being formed, with a capital of about $12,000,000. Edison light stock has been rising on the exchange and has reached 170.

—— Middleboro, Mass., will soon have an electric light plant. A company is being formed with a capital of $25,000, of which $10,000 will be furnished by citizens of the town who are desirous of having the lights as soon as possible.

—— The Toledo, O., Electric Light Company is working hard fitting up a new lighting system for the city. The company have a large force of men employed putting up poles and stringing wires, and the lights will be turned on by the 1st of January.

—— The East End Electric Light Company, of Pittsburgh, Pa., which was awarded the contract for lighting the city, is pushing as rapidly as possible, in order to get the lights up, and it will not be long until Fifth avenue and Penn avenue, from one end to another, will be illuminated by electricity. The arc lamps will be put in operation first, as they are the most important. The incandescent lights will be fitted to the gas posts as soon afterward as possible, and in six months the whole city will be illuminated by the new light.

—— The engine which is to run the city of Chicago's new electric light plant is all ready for business. The machine has sufficient power, and the house is large enough to accommodate many more dynamos than are to be placed at present. The original number of lamps proposed was 171. Twelve more have been added to this number, so that 183 lights have been put in place. 600 gas lamps are to be displaced by these arc lamps. Counting the gas burners at 16 candles, and the arc lamps at 2,000, the difference in illumination is easily figured Then, too, while the electric lamps will cost for maintenance about $15 per year, the gas lamps average about $25 each.

The New Ideal Engine.

The Ideal is an improved form of the celebrated Ide engine, designed to meet special requirements in electric lighting, such as high speed, small space, perfect regulation and absence of vibration. The Ideal has a doub'e frame with two sides, securing great rigidity, and has two main shaft bearings and doubld cranks, without out-board bearings.

Fig. 1 is a longtitudinal section showing the new lubricating devices; Fig. 2 is a vertical section through the main shaft, showing the same devices and the other self-oiling arrangements; and Fig. 3 is an elevation of the new automatic governor. Because of the heavy frame and sub-base, and the engine being self-contained and perfectly balanced, only light and inexpensive foundations are required, or the engines can be bolted to timbers bedded in the earth.

All parts of the engine are steel, phosphor bronze and charcoal iron, fitted to templets and gauges, and are interchangeable. Every engine is thoroughly tested by running; valves and governor are adjusted and set by the indicator and tachometer to operate perfectly under varying loads and steam pressures.

The new automatic cut-off governor is shown in position in fly-wheel. Adjusted in perfect equilibrium, it is truly an isochronous governor, and produces a splendid regulation. All its parts are in sight, and are readily accessible for cleaning. It is secured to the side of fly-wheel and connects through eccentric on main shaft direct to valve without the use of gearing, pulleys, shafts or belts. It is attached to the valve direct, and gives an open port at the beginning of each stroke, admitting steam to piston-head at full boiler pressure, and varies the point of cut-off, as the resistance requires, from the beginning to three-fourths of each stroke. It acts instantly, and cuts off the steam at a point that will just do the work and maintain the fixed speed of engine. The speed remains constant, regardless of the change of load or variation of steam pressure in boiler. The variation of speed from no load to the full power of the engine will be less than one per cent. The dash-pot attached to the eccentric prevents any sudden movement or jumping of the weight. The normal speed of the engine may be changed to suit requirements by shifting the weight. No oil cups are used on engine, and no oil is thrown on belts and engine-room floor, and engineer has no use for oil cans.

The crank-pin is large, and made of hard tool steel, ground to gauge and forced in with hydraulic press under a pressure of 20 to 40 tons, according to size of engine.

The method of oiling the main bearings and crank is peculiar. An oil chamber is provided under the two crank discs, which is supplied with enough oil to insure the discs dipping into the oil. When the engine discs are in rotation the centrifugal force causes the oil to be thrown into pockets provided in the hood over the discs. From these pockets the oil flows through the pipes into a receptacle or pocket cast upon the main bearings. From this point it flows into the groove and channel connecting with the crank-pin, which is hollow. The centrifugal force carries it into the crank-pin, from which it escapes through two holes into the bearing. Thus the main bearings receive constant lubrication, while the lubrication of the crank-pin is insured by the supply of oil from each side. Lubrication is constant and perfect, and provides for the most important bearings about the engine. Sufficient oil is placed in the basin under the crank-discs so it will flow in streams through both pipes to main shaft bearings and in drops to the eccentric, but valves are provided on the pipes so that the supply can be regulated as desired, and the oil chamber or basin can be supplied with fresh oil while the engine is running. The oil from this chamber can be drawn off by a cock in end of frame communicating with the pocket, and used over again. Besides the saving in oil, these devices keep a clean and presentable engine and engine room.

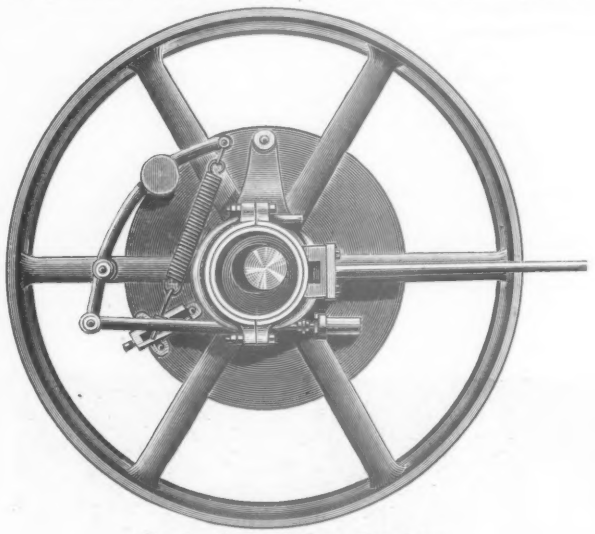


FIG. 1.—IDEAL ENGINE GOVERNOR.

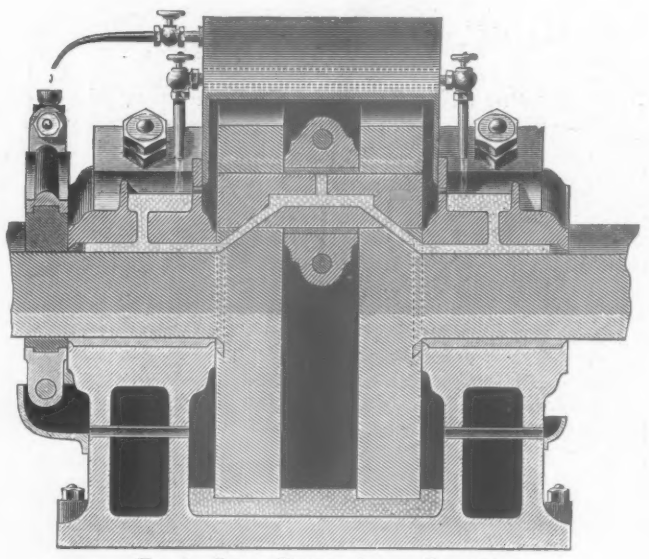


FIG. 2.—IDEAL ENGINE OILING DEVICES.

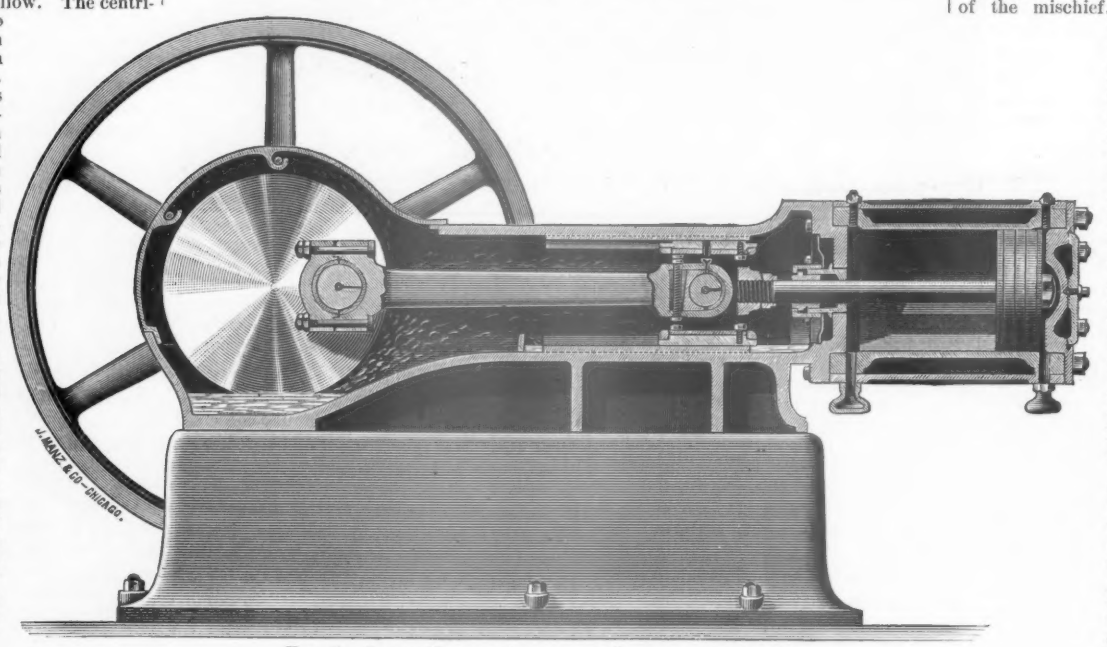


FIG. 3.—IDEAL ENGINE AUTOMATIC LUBRICATING SYSTEM.

—— The Brush Electric Co. are putting in a 60-arc light central station for Danvers, Mass. They are about completing a 300 light incandescant plant for the Slater Woolen Co., Webster, Mass., and a 450 light plant of the same kind for Washburn & Moen, Worcester Mass., while the Taunton Electric Co. have just added 90 arc lights to their plant. The business of the company is constantly increasing.

Mexican Concessions to Capitalists.

A dispatch from the city of Mexico says that before Congress adjourned last week, the Union Light, Fuel and Gas Company of America, an organization under the laws of Illinois, in which St. Louis, Chicago, New York and Detroit parties are largely interested, through the efforts of its representatives, Charles Wimple, its general manager, and George Hill Howard, its attorney, obtained an important concession from the Mexican government for the introduction of water, fuel and gas into all the cities and government buildings throughout the republic. Among the important things mentioned in the concessions is the free importation for 15 years of all materials necessary for the plant.

Recording a Chorus.

The Arion Singing Society, of Newark, held a rehearsal at Thomas A. Edison's West Orange Laboratory one afternoon last week and sang to the phonograph. Behind the conductor, Frank Van der Stucken, were three big funnels, respectively 19, 9 and 5 feet long, leading to as many phonographs. Mr. Wangemann and three other assistants adjusted the instruments, Mr. Edison being only a spectator and listener. The phonographs, by means of branched ear tubes, repeated the concert afterwards to 150 people in parties. This was the first experiment with so large a chorus (65 men), and the result was very satisfactory. The vocal parts were reproduced very distinctly indeed, and every effect of light and shade seemed as effective as when given under Mr. Van der Stucken's direction.

Electric Lighting in Berlin.

An enthusiastic correspondent writes that the arc lights of Berlin are things of beauty, an artistic embellishment to the city. Unter den Linden is probably the most brilliantly and beautifully illuminated street in the world. Along each side and down the center, where there is a double row of trees similar to Commonwealth avenue in Boston, the arc lights are set even more closely together than ordinary gas lamps, and the effect at night is that of great strings of white, gleaming pearls. The posts, heretofore illustrated in the REVIEW, consist of graceful iron standards, with tasteful ornamentation and curving over at the top. Here the globe is suspended, inclosed in a coarse network, so that, in case it breaks, the pieces of glass may not fall. From the globe there hangs a light chain, with a ring in the end, and there are counterbalancing weights inside the post, so that the lamp is quickly and easily attended to by pulling it down with a light stick, with a hook in the end--a great improvement, in the economy of time and trouble, over our clumsy methods of either climbing the post or lowering the light by an unwieldy and ugly crane.

The incandescent light is very extensively used. It illuminates all the first-class theatres, halls, hotels, and many stores and private houses. In the hotels it is the sole illuminant, and is not displayed merely in the showy parts of the establishment as a sort of advertisement, as with the greater number of English hotels where it is in use. It is used in all the chambers, which are the very places where it is most needed for the convenience and safety of the guests, assuring air unvitiated by gas, as well as avoiding all danger by leakage, blowing out the light, or the use of matches. At the Hotel Kaiserhof, for instance, the guest illuminates the room on entering by touching a little knob beside the door.

One Reason Why the Wires are not Underground in New York.

An electric conduit at Maiden Lane and Nassau street, a little after midnight on Wednesday of last week, exploded with a report that shook the ground for a considerable distance. The iron cap of the manhole which covers the conduit was turned over and a huge volume of flame shot upward. As the iron cap weighs 200 pounds, the force of the explosion was sufficient to have caused much loss of life, remarks the N. Y. *Tribune*, had the accident occurred in the busy part of the day. Not much damage was done to the buildings in the surrounding neighborhood, a few dislodged paving stones and a cracked window comprising the sum total of the mischief. The only trace of the accident to be seen the next day was the new cap which had been laid down in the early morning. Henry J. Smith, of the Edison Electric Illuminating Company, to whom the conduit belonged, was seen by a *Tribune* reporter and expressed the opinion that the accident had been caused by the formation of an arc in the conduit box. The spark thus created communicated with the accumulations of gas in the man-hole and brought about the explosion. The company had not yet made an examination of the conduit, but was satisfied that the explosion had happened in the way described.

President Lynch, of the United States Illuminating Company, said: "This is only another instance of the danger of running electric cables under the ground. The whole point of the difficuty lies in a nutshell. Whenever the electric insulator from any cause becomes impaired, the current must form a connection with the ground, and a spark is generated. If this should happen in any receptacle where gas, more or less mixed with air, has accumulated and where such gas is within a narrow compass, such as a manhole, an explosion must follow. The business man or other pedestrian walking unsuspectingly over a conduit can never be sure that it will not explode and blow him to pieces."

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING DECEMBER 11, 1888.

394,555 Annunciator; William C. Clark, Portland, Me.

394,568 Switch or circuit changer; William W. Griscom, Haverford College, assignor to the Electro Dynamic Co., Philadelphia, Pa.

394,613 Separating petition for galvanic batteries; Isaiah L. Roberts, Brooklyn, assignor to the Roberts-Brevoort Electric Co. (Limited), New York.

394,614 Separating-diaphragm for galvanic batteries; Isaiah L. Roberts, Brooklyn, assignor to the Roberts-Brevoort Electric Co. (Limited), New York.

394,615 Treating diaphragms and cups for use in electric batteries; Isaiah L. Roberts, Brooklyn, assignor to the Roberts-Brevoort Electric Co. (Limited), New York.

394,616 394,617 Diaphragm for galvanic batteries; Isaiah L. Roberts, Brooklyn, assignor to the Roberts-Brevoort Electric Co. (Limited), New York.

394,621 Electric tramway; Michael H. Smith, Halifax, County of York, England.

394,627 Electric brake system; Watson P. Widdifield, Uxbridge, Ontario, Canada, and Alexander H. Bowman, Packerton, Pa.

394,638 Separating partition for galvanic batteries; Henry L. Brevoort and Isaiah L. Roberts, assignors to the Roberts-Brevoort Electric Co. (Limited), New York.

394,642 Distribution of electricity by secondary batteries; Thos. P. Conant, New York, assignor to the Electrical Accumulator Co., of New York.

394,648 Conduit for electric or cable railways; Thaddeus W. Harris, New York.

394,670 Galvanic battery; Robert D. Wright, Kirkwood, Mo.

394,680 Support for incandescent electric lights; Alfred Dawes, Chelsea, Mass.

394,697 Telegraphy; Percy F. Jamieson, Batavia, Ohio.

394,728 Indicator for electric circuits; Oliver B. Schallenberger, Rochester, assignor to the Westinghouse Electric Co., Pittsburgh, Pa.

394,734 Driving gear for electro magnetically propelled vehicles; William L. Stevens, Boston, Mass.

394,735 Electro magnetically propelled vehicle; William L. Stevens, Boston, Mass.

394,784 Electric signaling apparatus; George F. Milliken, Boston, Mass., assignor to the Gamewell Auxiliary Fire Alarm Co., same place.

394,791 Electric arc lamp; Rupert Schefbauer, Dresden, Saxony, Germany, assignor to Weber and Schefbauer, same place.

394,807 Electro therapeutic tool holder; Allan H. Bacon, Webster Groves, Mo.

394,810 Carbon electrode for electric batteries; John Beattie, Jr., Fall River, Mass.

394,818 394,819 Dynamo electric machinery; Charles S. Bradley, Yonkers, N. Y.

394,832 Telephone system; John F. Casey, St. Louis, Mo.

394,833 Telephone exchange system; John F. Casey, St. Louis, Mo.

394,837 394,838 Conveying electric energy; Sebastian Ziani de Ferranti, Hampstead, County of Middlesex, England.

394,839 Magneto generator for fire alarm circuits; William L. Denio, Rochester, N. Y., assignor of two-thirds to Daniel B. Platt and Herbert L. Bushnell, same place.

394,880 Electric meter; Anthony Reckenzaun and James A. Pentz, Philadelphia, Pa.

394,881 Electric meter; Anthony Reckenzaun, Philadelphia, Pa., assignor of one-half to James A. Pentz, same place.

394,883 Dynamo electric machine; George W. Riethmann, Denver, Col.

394,887 Electric locomotive; Sidney H. Short, Denver, Col., assignor to the United States Electric Co., same place.

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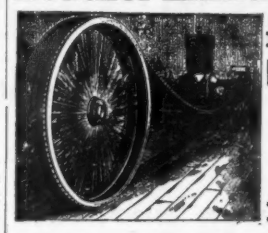

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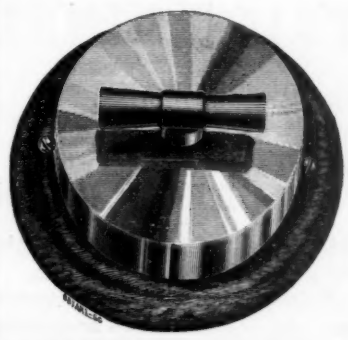

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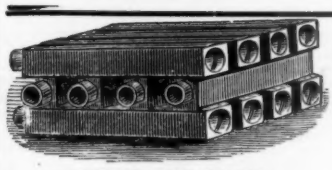

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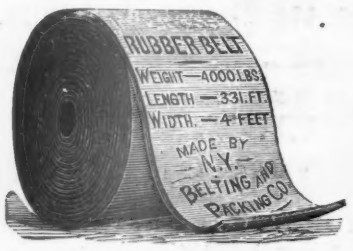

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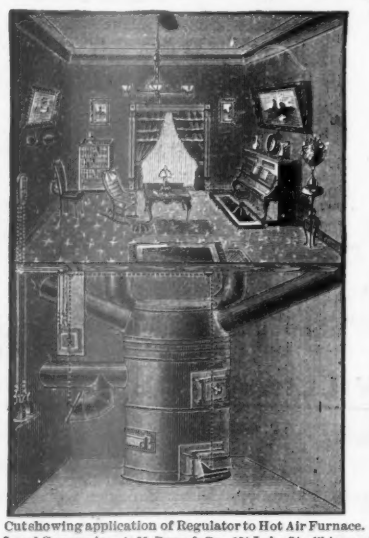

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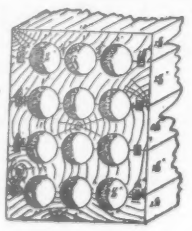

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